THE SETTLEMENT OF NOMADS IN THE SUDAN: THE CASE OF KHASHM EL GIRBA AGRICULTURAL SCHEME.

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ABSTRACT

The settlement of nomads in the Sudan is examined through an analysis of the performance of the scheme at Khashm el Girba in geographical, economic and social terms. The first chapter deals with the methodology of the approach, while the next two chapters respectively give the background to the settlement of nomads in general, and the scheme at Khashm el Girba in particular. The following four chapters assess the success of the scheme's attempts to settle the nomads in a physical sense, and through economic performance in and social conditions arising from the project's implementation. It is shown that, while there is a high rate of tenancy allocation, the actual numbers settled fall considerably below the expected level. It is further demonstrated that, due to various problems experienced on the scheme, the crop rotation barely provides an adequate income for the farm tenant, except where sufficient resources already exist to allow the required inputs. This results in many settlers retaining interests in their former way of life - pastoralism - while the economic structure of the society is perpetuated, thereby increasing the disparity between rich and poor. In the national context the scheme is shown to be successful, contributing significantly to the annual national budget. Socially the increased provision of education and health facilities is shown to be beneficial, although malaria and bilharzia remain serious health problems. It is concluded that, while the scheme cannot be viewed as a complete success, the settlers, through their adaptations, have achieved their own success by integrating crop production with livestock rearing, and that such an integration is a rational approach to the conditions existing in the area. It is therefore suggested that in future more attention need be paid to the people involved in agricultural production, as it is they who

ultimately determine the overall performance of any scheme.

To my mother,

For her continual encouragement.

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Other people apart from those mentioned above have also provided me with assistance in one way or another, but are too numerous to mention. So. to all those not mentioned by name above I wish to extend my sincere thanks.

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LIST OF ABBREVIATIONS

A.P.C.	Agricultural Production Corporation
Anth. Quart.	Anthropological Quarterly
Conf.	Conference
Cont.	Continued
Dept.	Department
DP	Development Programme
Doc.	Document
E.A.Journ. of Rural Devt.	East African Journal of Rural Development
Ed.	Editor
EPTA	Expanded Programme of Technical Assistance
F.A.O.	Food and Agricultural Organisation
Geog.	Geography
HAVA	Helmand Arghandab Valley Authority
H.E.P.	Hydro-electric power
H_o	Null hypothesis
H_1	Alternative hypothesis
I.L.O.	International Labour Office
Inst.	Institute
Int.	International
I.S.S.J.	International Social Science Journal
Iraqi Geog. Journ.	Iraqi Geographical Journal
J.D.Areas	Journal of Developing Areas
LS	Sudanese pounds
MEED	Middle East Economic Digest
M.E.Int.	Middle East International
M.E.Journ.	Middle East Journal
n.a.	not available

n.d.	no date
No.	number
Nr.	number
p.	page
p.c.	per cent
P.T.	Piastre
Phil. Soc.	Philosophical Society
S.W.Journ. of Anth.	Southwestern Journal of Anthropology
S.Journ of Vet. Sci. and An. Husb.	Sudan Journal of Veterinary Science and Animal Husbandry
S.N. and R.	Sudan Notes and Records
T.A.P.	Technical Aid Programme
Tijd. Voor Econ. en Soc. Geog.	Tijdschrift voor Economische en Sociale Geographie
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations International Childrens Emergency Fund
UAR	United Arab Republic
USAID	United States Agency for International Development
Vet.	Veterinary
Vol.	Volume
W.R.C.	Wadi Halfa Resettlement Commission

A note on transliteration of Arabic words and place-names

Place-names and other Arabic words used in the text are transliterated according to the system adopted by the Sudan Notes and Records, which applies as follows:

1) For well-known names such as Khartoum and Omdurman the conventional spelling is used.

2) For geographical names the conventional spelling used by the Sudan Government Survey Department is followed, even where it does not agree with the transliteration outlined below.

3) In all other cases transliteration occurs as follows:

ا	at the beginning of word omit, otherwise hamza
ب	b
ت	t
ث	th (coll. t or s)
ج	j or g
ح	h
خ	kh
د	d
ذ	dh (coll. d)
ر	r
ز	z
س	s
ش	sh
ص	ṣ
ض	ḍ
ط	t
ظ	z
ع	‘ (glottal stop)
غ	gh
ف	f
ق	q (coll. g)
ك	k
ل	l
م	m
ن	n
ه	h
و	w
ي	y

/cont.

cont./

Vowels: a - short ā - long

i - short ī - long

u - short ū - long

Diphthongs: ى ai (e.g. aisle)

و au (e.g. mauser)

The ل of the article always remains l.

The silent t (ة) is omitted.

Colloquial vowel sounds of e and o are expressed as e and o in short, and ē and ō in long.

CHAPTER ONE

INTRODUCTION

1.1 Introductory Remarks

Since agriculture first developed, nomadism has been an important means of exploiting the resources of a marginal environment for much of man's history (1). Indeed, though more extensive formerly than at present, it remains widespread throughout much of the Old World, stretching:

> ". . . . . from the Bering Strait to the Mauretanian coast and from the Siberian tundra to east Africa. (With pockets further south and south-west)." (2)

It is now, nearly everywhere a declining way of life, but still constitutes in many regions and countries a significant proportion of the population. Grigg quotes a figure of one per cent of the population of the Middle East (3), but many countries contain far more significant proportions of nomadic peoples, notably Afghanistan, Saudi Arabia and the Sudan. (Table 1.1 gives figures for selected countries in Africa and the Middle East).

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(1) Bobek, Toynbee and others suggest that pastoral nomadism is a development from settled agriculture, rather than from a hunting and gathering economy.

(2) B. Spooner "Towards a Generative Model of Nomadism". In Anth. Quart. Vol. 44, No. 3 'Comparative Studies of Nomadism and Pastoralism', July 1971 p. 201.

(3) D. Grigg "The Harsh Lands: A Study in Agricultural Development", London, 1970 p. 174.

Table 1.1. Nomadic populations of selected countries in Africa and the Middle East.

country	total population	nomadic population(1)	per cent nomadic
Afghanistan(3)	16,000	2,000	12.5
Ethiopia(4)	22,000	7,000	31.8
Iran(3)	20,000	2,000	10.0
Jordan(2)	4,000	100	2.5
Libya(2)	1,500	150	10.0
Saudi Arabia(2)	4,500	2,000	44.4
Somalia(4)	2,303	1,500	65.1
Sudan(2)	12,000	2,400	20.0
U.A.R.(2)	29,000	300	1.0

All figures are in 000s.

(1). Many of the figures for nomadic populations are only rough estimates, for the reason that in some countries the means of enumeration of nomads is inadequate, while in others no reliable census has been taken.

(2). The estimates for the Sudan, Jordan, Libya, Saudi Arabia and the U.A.R. come from the Report of Panel III. The economic and social development of nomadic populations before and after settlement. in: M.R. el Chonemy(ed). Land Policy in the Near East. Proceedings of the Development Centre on Land Policy and Settlement for the Near East. Held in Tripoli, Libya, 1965. Rome. 1967. For the Sudan, however, a more reliable estimate is provided by R.A.Henin(b). "A re-estimation of the nomadic population of the six northern provinces." in: S.N.&.R. Vol. 47. 1966, who gives the proportion as 31 per cent.

(3). The figures for Iran and Afghanistan are from W.B.Fisher(a). The Middle East: a physical, social and regional geography. London. 1971.

(4). The figures for Somalia and Ethiopia come from A.H.Abdalla. General problems of nomadism in Sudan, Ethiopia and Somalia. Draft Working Paper from the Ministry of Local Government, Republic of the Sudan to Co-operative, Rural and related Institutions Branch, Social Institutions Development Department. No. ML6/10-A-15-4. I.L.O. Geneva. 1968. mimeographed.

To the governments of nearly all countries with nomadic populations, but to those with large numbers in particular, the nomads represent a backward society, which contributes little or nothing to the economy or development of that particular country. Consequently, an improvement in the productivity of nomadic areas and the integration of nomadic groups into the national economy is viewed as desirable, and to this end the settlement or sedentarisation (4) of nomadic groups is attempted. While the literature on nomadism in general, and on certain nomadic groups in particular, is fairly extensive (5), the question of the settlement of nomads has received relatively little attention (6). Governments continue to attempt the implementation of settlement schemes, but there appears to be very little feedback in terms of the analysis of the performance of such schemes, with the result that little of value can be learnt for application to other schemes. The present study is an attempt to examine

(4) For the purposes of this thesis the term 'settlement' will be used in preference to the term 'sedentarisation' - this is purely a personal preference.

(5) See for example, P. H. Gulliver "The Family Herds: A Study of Two Pastoral Tribes in East Africa - The Jie and The Turkana", London, 1955 and D. J. Stening "Savanah Nomads: A Study of The Wodaabe Pastoral Fulani of Western Bornu Province, Northern Region, Nigeria", London, 1959.

(6) For example, in the early 1960s UNESCO dealt with the settlement of nomads in 2 of its Arid Zone Research Series publications:

Volume XIX "Nomades et Nomadisme au Sahara", Paris, 1963.

Volume XVIII "The Problems of the Arid Zone: Proceedings of the Paris Symposium, 11-18 May 1960", Paris, 1962.

More recently A. R. George has covered the subject in 2 articles:

"Processes of Sedentarisation of Nomads in Egypt, Israel and Syria". In Geog. Vol. 48, No. 2, 1973.

"Egypt's Remaining Nomads". In M. E. Int., July 1974.

Details of other publications on the subject can be found in the bibliography at the end of the thesis.

the process of settlement in one particular scheme in the Sudan, and to evaluate the lessons that can be learnt from that scheme and applied to similar schemes in the future.

1.2 Nomadism: Some Definitions

Before moving on to discuss the aims and methodology of the study, it is necessary to define the term 'nomadism', which has been attempted in a variety of ways using many different criteria. In its widest sense it can be used to include any person or group of persons whose way of life involves movement from one place to another, be that movement regular and predictable or sporadic and unpredictable. On purely etymological grounds, however, nomadism should involve the concept of grazing, being derived from the Greek word 'νέμείν' meaning 'to graze' (7). Two basic notions must, therefore, be included in any attempt to define the term 'nomadism': movement and grazing. Consequently, any society which migrates but does not herd livestock, such as the hunting and gathering Bushmen of the Kalahari, who move "several times a year when the local food supply gets scarce" (8), must be excluded from the definition, as must any group who graze livestock, but whose mode of existence does not involve movement with those animals, such as the ranchers of Argentina or Australia. In view of these considerations the definition suggested by Patai appears to cover the necessary points:

> ". . . . . nomadism . . . . . is the mode of existence of peoples who derive their livelihood from tending herds of one or more species of quadrupeds and who wander to find grazing". (9)

(7) R. Patai "Nomadism: Middle Eastern and Central Asian". In S. W. Journ. Anth. Vol. 7, 1951 p. 401.

(8) C. D. Forde "Habitat, Economy and Society: A Geographical Introduction to Ethnology", London, 1963 (first published 1934) p. 27.

(9) R. Patai op. cit. p. 401.

Nomadism as defined above covers the whole spectrum of nomadic activity existing between:

> ". . . . . purely sedentary society on the one hand, and a hypothetical 'pure' nomadism that has no contact whatsoever with agriculture on the other". (10)

Within this continuum many different adaptations exist, varying according to many different factors, such as the nature of the movement, the relative importance of the cultivation of crops as compared with livestock herding, and the length of time spent in one location.

As the groups which have been involved in settlement in the Sudan have been largely classified as semi-nomadic, it is necessary to discuss briefly the various types of semi-nomadism which can occur. As nomadism implies movement and the grazing of livestock, the term 'semi-nomadism' must imply some diminution in the importance of one or both of these aspects of true nomadism. In the context of movement, a group can be termed 'semi-nomadic' if a part of the group is not involved in movement, but remain largely in one place, while another portion of that same group go in search of pasture for their livestock. On the other hand, relating more specifically to the livestock aspect of nomadism, a group may be termed 'semi-nomadic' if it undertakes, in addition to its livestock rearing, the cultivation of some crop, be it for subsistence purposes or otherwise. These two aspects of semi-nomadism are logically brought together when the sedentary part of a group undertakes cultivation, while the migratory part tends the herds. Thus, semi-nomadism involves the introduction of both less movement and less dependence on livestock; in

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(10) D. L. Johnson (a) "The Nature of Nomadism: A Comparative Study of Pastoral Migrations in South-Western Asia and Northern Africa", Dept. of Geography, University of Chicago, Research Paper No. 118, 1969 p. 12.

addition, the varying degrees of integration of these two aspects of semi-nomadism means that there must exist differing stages of semi-nomadism. One final point needs to be made with regard to transhumance, which is a specialised form of nomadism, involving the seasonal and regular movement of herds from winter to summer pastures in mountainous areas, the term originating from the valleys of southern Europe (11).

1.3 The Study

1.3.1 Criteria For The Choice Of The Study Area

Given that the study was to concern itself with the settlement of nomads in the Sudan, it remained to determine the exact nature of the approach to be taken. First, it was necessary to decide at which level the subject should be studied: ie, whether to examine the problem at a general level or to use the case-study approach. The dilemma of which of these approaches is more relevant has been the subject of debate for geography, and indeed for many other social sciences, since the subject first came to recognition, but there appears to be no definitive solution to the problem, and the most productive attitude is probably that of Abler, Adams and Gould, who stress that both approaches are necessary to achieve a full understanding of any phenomenon (12). Consequently, such a choice tends to be rather subjective, although other considerations may be taken into account. In the case of the settlement of nomads it was believed that more case-study material need be built up before studies of a more general nature can be undertaken. Therefore the case-study approach was preferred.

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(11) C. D. Forde op. cit. p. 396.

(12) R. Abler, J. S. Adams and P. Gould "Spatial Organisation: The Geographer's View of the World", New Jersey, 1971, p. 4.

The choice of the particular study selected also requires examination. The range of possibilities at first appeared to be limited, but closer investigation revealed that practically all irrigation schemes in the Sudan, be they small-scale or large-scale, have involved, to some degree, the settlement of nomads. However, in only a few of these schemes was the settlement of nomads explicitly expressed government policy, rather the schemes were devised for agricultural development in general (13), or even in some cases for political purposes (14). In such schemes, the settlement of nomads was largely incidental, and this is true of all the larger schemes in the country, such as the Gezira, and the Gash and Tokar delta schemes. Stated explicitly in the aims of the scheme at Khashm el Girba, however, was the desire to achieve the settlement of the local nomadic population of the area (15). This factor was one of the main criteria behind the choice of Khashm el Girba as the study area, as it was

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(13) I.L.O. Report to the Government of the Sudan on the Sedentarisation of Nomadic Tribal Populations in the Butana region of Northern Sudan. Study Planning Mission, Nov. 1963 - Feb. 1964. I.L.O./T.A.P./Sudan/R.8, Expanded Programme of Technical Assistance, Geneva 1965 p. 3.

(14) African Development, Sudan Special, January 1975.

(15) M. Y. Sukhar and M. H. el Jack "Mass Resettlement of the Population of the lands flooded by the Aswan High Dam: A Socio-Economic Appraisal of the Resettlement of the People of Wadi Halfa at Khashm el Girba Agricultural Scheme". In Papers presented to the National Conference on Human Environment and Development, held 5th - 12th Feb. 1972. Khartoum, 1972.

They give the main aims of the scheme as follows:

a) The resettlement of the population of the flooded lands at Wadi Halfa.

b) To increase utilisation of agricultural land and thus increase production leading to an improvement in the employment situation and balance of payments.

c) To provide for the settlement of the indigenous nomadic and semi-nomadic tribes of the area.

pp. 24 - 25.

intended to attempt to analyse the settling population's adaptation to a proscribed government plan. Khashm el Girba is not, however, the only government scheme where the settlement of nomads has been explicit policy, but others, such as the ones at Babanusa and Jiraih es Sirha have already been examined (16), and, furthermore, were not organised on such a large scale. In addition, the scheme at Khashm el Girba has received considerable attention because of the resettled Nubian population present, while the settlement of nomads has been the subject of relatively little work. Added to this is the fact that, although some work has been carried out on nomadic groups in the west, such as the Baggara (17) and the Kababish (18), and in the south, such as the Nuer (19), relatively little has been done on the nomads of eastern Sudan. This is remarkable when it is considered that Kassala Province (20) has the highest proportion of nomads of any of Sudan's six northern provinces (21).

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(16) For Babanusa, see T. Asad, I. Cunnison and L. G. Hill "Settlement of Nomads in the Sudan: A Critique of Present Plans". In D. J. Shaw (ed) Procs. of the Thirteenth Annual Conference of the Phil. Soc. of Sudan on Agricultural Development in the Sudan, Khartoum, 1966, and for Jiraih es Sirha see F. A. Fadlalla (a) "A Scheme Report on Jiraih es Sirha Rural Development Scheme", Dept. of Geography, University of Khartoum, 1972.

(17) I. G. Cunnison (a) "Baggara Arabs: Power and Lineage in a Sudanese Nomad Tribe", Oxford, 1966.

(18) T. Asad "The Kababish Arabs: Power, Authority and Consent in a Nomadic Tribe", London, 1970.

(19) E. Evans Pritchard "The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People", Oxford, 1960.

(20) Kassala Province here refers to that area delineated prior to the reorganisation of 1974, and as such includes both the present Kassala and Red Sea provinces. Except where otherwise stated this will be true throughout.

(21) R. A. Henin (b) "A Re-estimation of the Nomadic Population of the Six Northern Provinces". In S. N. and R. Vol. 47, 1966.

The final consideration to be taken into account in the choice of the scheme at Khashm el Girba was the imminent implementation of the scheme at Rahad, designed to utilise the waters of the Roseires Dam, which is situated on the western edge of the Butana (Figure 1.1) and which is to follow similar lines to those employed at Khashm el Girba, and is also to involve the settlement of nomads (22). Consequently, bearing in mind the fairly close similarities of environment and also the possibility that the Shukriya tribe will be involved in the settlement, any conclusions concerning the situation at Khashm el Girba may also have some relevance to the situation at Rahad.

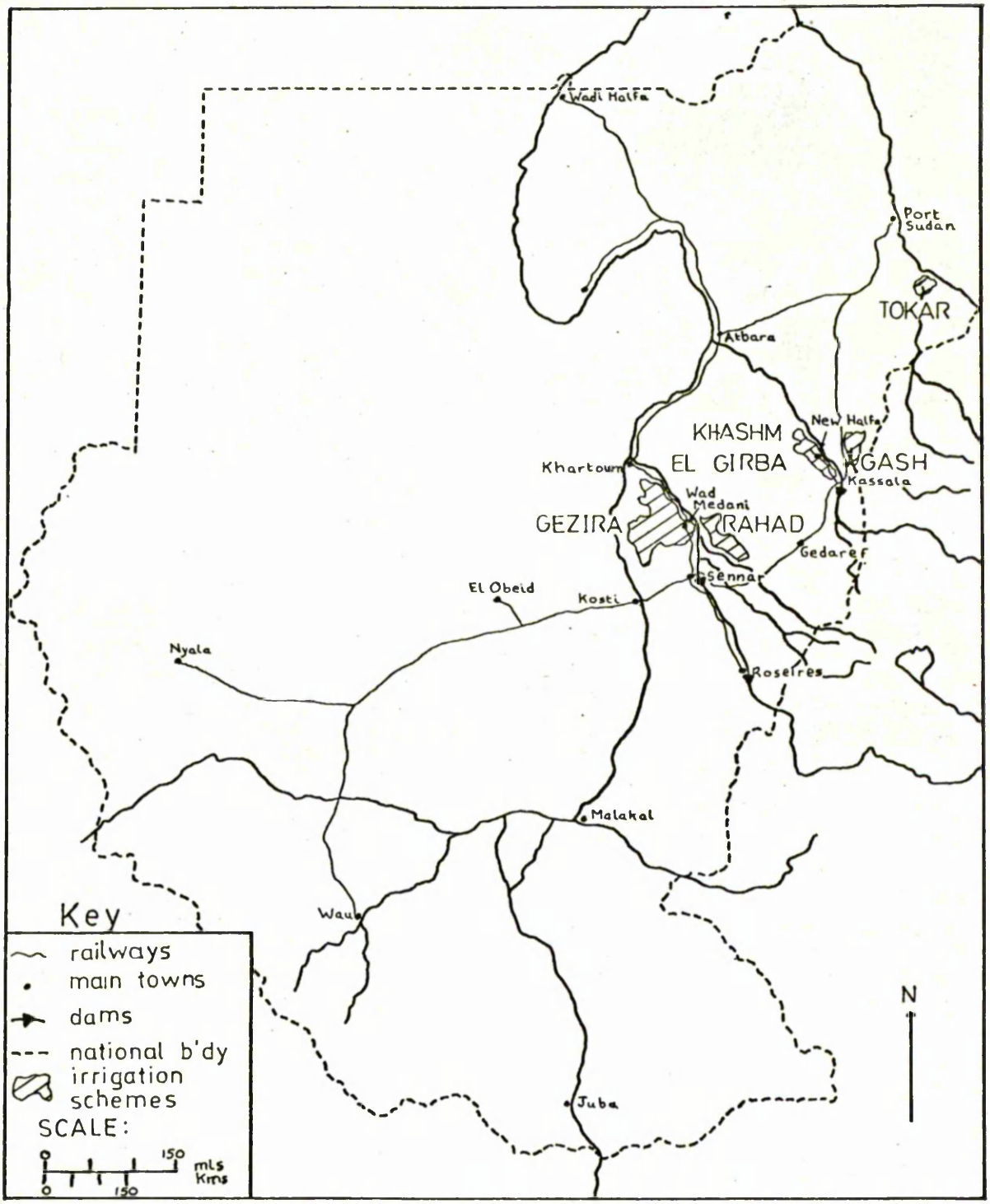
1.3.2 The Study Area

As outlined above, the area chosen for this study of the settlement of nomads in the Sudan was the Khashm el Girba Irrigation Scheme, which is situated in Kassala Province, eastern Sudan. It lies about 350 kilometres east of the capital, Khartoum, on the eastern edge of the extensive Butana plain, which stretches from the confluence of the Atbara and main Nile rivers in the north, to the Ethiopian border in the south. The scheme runs parallel to, but a few kilometres west of the Atbara River (Figure 1.1).

While to give an exact definition of the area under irrigation is possible, to confine the definition of the study area to such limits is undesirable, largely because a proportion of the people participating in the scheme do not actually live within the irrigated area, but on its fringes. Consequently, any definition of the study area must be inclusive rather than exclusive, and can probably best be stated as follows: that

(22) Republic of the Sudan (h) Ministry of Finance and Economy. Roseires Pre-Investment Survey, Report No. 2, Rahad Project, Vol. IV Agriculture. Huntings Technical Services Ltd., London, 1965.

Figure 1.1. Sudan: Location of the Study Area.



land in the eastern Butana, which is now under irrigation, together with those surrounding areas whose population is participating in the scheme. However, sections of this large area, covering half a million feddans approximately (23), are not strictly concerned with the settlement of nomads: namely, Phase I, which is almost exclusively inhabited by Nubians displaced from the Wadi Halfa region by the flood-waters of the Aswan High Dam; and the area commanded by the sugar plantation, amounting to over 30,000 feddans (24). These areas can largely be excluded from consideration (Figure 1.2).

1.3.3 Aims Of The Study

From the original idea to study the settlement of nomads in the Khashm el Girba Irrigation Scheme developed a more concrete and definable general aim which may be stated as follows: to attempt to assess the success of the settlement of nomads on the Khashm el Girba scheme. This may more formally be stated in the following hypothesis:

> That the scheme at Khashm el Girba has succeeded in settling large numbers of nomadic and semi-nomadic peoples from the surrounding areas of the Butana, and that this settlement has been accompanied by the economic and social development of the people concerned, and has affected a greater contribution of these people to the national economy.

This hypothesis falls into four convenient divisions: the physical settlement of the formerly nomadic population; the economic development of that population; its social development; and its contribution to the national economy. From an analysis of these four aspects it is hoped to be possible to examine adaptations made by a population moving into an alien environment, and also to outline some of the factors affecting the

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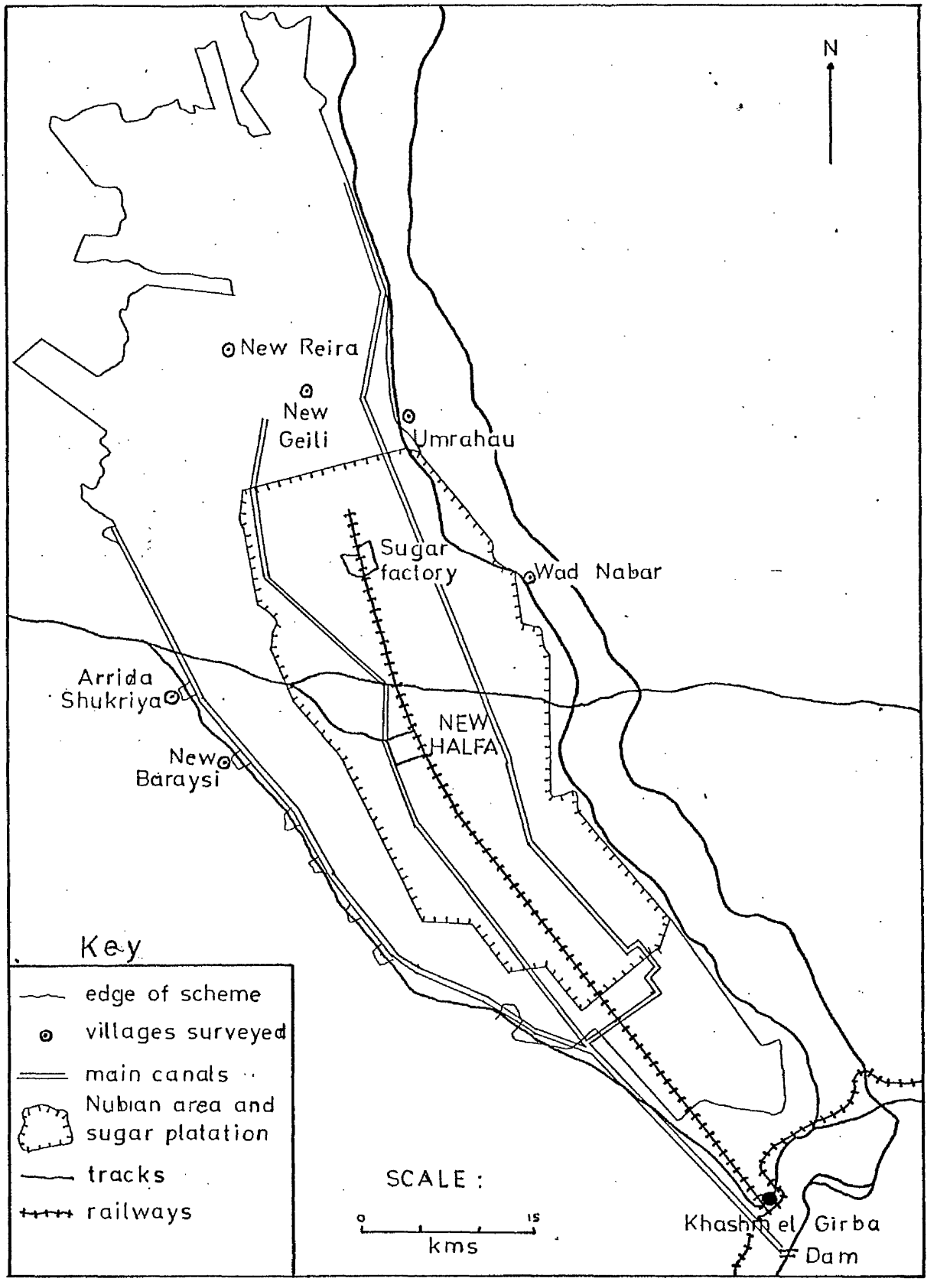
(23) One feddan equals 1.038 acres or 0.417 hectares.

(24) G. D. Sid Ahmed (b) "The First Year at Khashm el Girba". In S. N. and R. Vol. 58, 1967 p. 160.

Figure 1.2. The Study Area.



scheme's performance, with a view to defining some of the problems which have been encountered, in order to highlight their relevance, not only to the scheme at Khashm el Girba, but also to other attempts at the settlement of nomads, notably at Rahad.

1.4 Methodology

1.4.1 Means Of Data Collection

The data collected for this study was obtained during a field study visit to the Sudan of some 5 months duration. The information collected can be divided into 2 types: that collected at the general level; and that of a far more specific nature. At the general level, information was collected from various government departments, first, concerning the settlement of nomads in general in Sudan - from the Ministry of Local Government, Housing and Community Development - and second, basic information relating to the scheme itself - from the Ministry of Agriculture, Food and Natural Resources. The information contained in the second category was supplemented by interviews with officials on the scheme attached to various government departments, such as the Local Government offices, the Agricultural Production Corporation (A.P.C.), the Irrigation Department, the Health Department, and the Veterinary Department. In many cases, such sources also provided more detailed information regarding the scheme.

In addition to the sources mentioned above, specific information concerning the study came from 4 other sources:

a) Interviews with local field and extension officers to ascertain the administrative situation at the level which is most involved with the inhabitants of the scheme.

b) A questionnaire survey of a sample population of selected villages within the scheme area: this constituted the major part of the survey.

c) This was supplemented by less formal interviews with other inhabitants of the scheme in villages other than those which were surveyed, with village chiefs and with members of village committees.

d) Observation.

1.4.2 Sampling Framework

The questionnaire survey was conducted within 6 villages in the scheme area, and a 10 per cent random sample of households (25) taken in each village. Each village was selected, and some explanation is necessary of the criteria used in that selection. Thus, 4 main criteria were used: location, tribal composition, date of incorporation into the scheme, and the extent of the social services, such as schools and medical facilities, provided. The relevance of each of these criteria will now be outlined.

a) Location. Two groups of villages involved in the scheme are discernible immediately: those lying along the River Atbara many of which were in existence prior to the scheme; and those located on the Extensions of the scheme. The population breakdown of these 2 groups shows an approximate 2:1 ratio in favour of the Extension villages, and the number of villages chosen from each group was related to this ratio. Within the Extensions 2 further groupings based on location are possible: those villages situated on the very western edge of the scheme, and those in the scheme's central area, between which population is fairly evenly distributed. With an approximate village size of 250 households, 6 villages were chosen, 2 from each locational grouping, giving a total number of questionnaires to be taken of about 150, which, it was felt, was a manageable number.

(25) A household is here defined as "all persons who share the same cooking pot" and is taken from R. A. Henin (a) "Fertility Differentials in the Sudan (with reference to the nomadic and settled populations)", Ph.D. Thesis, London, 1966 p. 29.

b) Tribal Composition. Tribal groups involved in settlement on the scheme include the Shukriya, Ahamda, Lahawin and Beja. In some of the villages one tribe predominates, while in others there are tribal mixtures. Overall the Shukriya predominate. Thus, in the west the Shukriya are almost the sole inhabitants, and in this area, therefore, selection was not affected by tribal grouping, but along the River Atbara both Ahamda and Shukriya tribes are represented, and one village was chosen to represent each group. The villages in the central part of the scheme tended to be the most heterogeneous in terms of population composition, and hence their selection was not affected by the criterion of tribal composition.

c) Date Of Incorporation Into The Scheme. The scheme was developed in several phases, and it was thought advisable to utilise different dates of incorporation into the scheme as a further criterion in the selection of the villages. Thus, one village was chosen from Phase I, one from Phase II, 2 from Phase III, and 2 also from Phase IV.

d) Extent Of Social Services Provided. The provision of social services by the Government in the Extension areas is irregular, so that some villages are provided with all the services available, while others have only limited services or none at all. Thus, of the villages in the west, one well-provided village was chosen, while the other one was provided with no services whatsoever. Similarly, in the east of the scheme a contrast was maintained between a well-provided village and one lacking in services. The selection of villages in the central portion of the scheme took into account the provision of different facilities: thus, one village had a school but no medical facilities, while for the second village the reverse was true.

The villages chosen using the above criteria were, in the west, Arrida Shukriya and New Baraysi; in the central part of the scheme, New Geili and New Reira; and by the river, Wad Nabar and Umrahau. Their location is shown in Figure 1.2.

The 10 per cent random sample taken in each of these villages was based upon a survey conducted by the Malaria Section of the Health Department in New Halfa during December 1973 and January 1974 (26). The questionnaire itself, was divided into 4 sections, dealing with demography, economic life and social life, with the final section being a general one (see Appendix A).

The choice of the sampling framework used to implement this questionnaire requires some explanation, expecially regarding its preference over other possibilities. The scheme at Khashm el Girba contains approximately 16,000 non-Nubian tenants: ie, tenants who were formerly nomadic or semi-nomadic, and who have come largely from the area which the scheme now occupies, as well as from other parts of the Butana Plain. A simple random sample of this population was almost immediately excluded from consideration due to 2 main factors: first, a 10 per cent random sample would not have been practical, as not only would it have involved 1,600 questionnaires, but it would also have required a large and flexible amount of transport, and transport proved to be one of the most difficult problems of the survey's field research (27). But more importantly, preliminary investigations revealed that such a sample would have excluded an important proportion of the nomads settling on the scheme, as the scheme has attracted people not only to take up tenancies but also

(26) This survey included the enumeration of every household on the scheme.

(27) For further discussion of the transport problem see Section 1.4.3.

to undertake agricultural labouring and other employment. A framework involving a simple random sample would have excluded these important elements.

At the other end of the scale, one possibility was a detailed study of one particular village on the scheme. This method would have had the advantage of including a wide range of elements of the population aside from its obvious distinct practical advantages. Indeed, in his anthropological study of the Nubian resettlement on the scheme, this method was employed by Sorbo (28). It was felt, however, that such an approach would have had limited applicability to conditions in the rest of the scheme, and, although a similar argument might be levelled at the approach finally adopted, it was believed that a detailed study of 6 villages, supplemented by interviews in, and concerning, other villages would provide reasonably representative examples of the situation on the scheme as a whole. In effect, therefore, the scheme eventually used was a compromise between 2 extreme approaches, and as such was an attempt to overcome the drawbacks of the other outlined possibilities.

1.4.3 The Implementation And Its Problems

For the implementation of the questionnaire survey and general interview work, 2 fieldwork assistants were employed. It was necessary to use fieldwork assistants for this work, as the author's knowledge of Arabic was insufficient to allow personal interview, except at the most rudimentary level. To ensure as reliable answers as possible utilising this method, several precautions were taken: first, local Arab students from the Higher Secondary School in New Halfa were employed, because it was felt that such assistants would create more confidence in the survey amongst the people being interviewed, than if assistants from outside

(28) G. Sorbo "On and Off-Scheme Interests" (a), University of Bergen, 1972.

the area were used. In addition as a check on the translation of the questionnaire itself, and also to ensure that the fieldwork assistants fully understood the requirements and implications of each question, the questionnaire was fully scrutinised in the presence of the fieldwork assistants. To increase confidence in the survey further, the President of the Farmers' Union, himself an Arab of the Shukriya tribe, was contacted and asked to assure the inhabitants that any information they might give would be treated in strict confidence, to which he agreed. Finally, in each village visited, the local chief or sheikh was contacted before the implementation of any questionnaires or interviews. As a final insurance, the author was always present during the enumeration of questionnaires in order to deal with any points relating to specific questions, and also to check immediately that all questions had been answered.

The problems encountered during the implementation of the survey can conveniently be divided into those of a general practical nature, and those concerned with the actual implementation of the questionnaire. On the practical side 2 main problems were encountered: language and transport. The means by which the language problem was overcome have been outlined above, but the transport problem was less easily solved. It was not transport between Khartoum and the study area that proved problematic, but the transport situation within the study area itself. No personal transport was available, either through hiring from Khartoum, where costs proved prohibitive, or in the scheme area itself, where motor vehicles, even in government departments, are scarce. Consequently, use had to be made of the limited local facilities available: in some cases local buses or lorries were taken (29), while in others government departments

(29) For example the New Halfa-Rufa'a bus was taken to Arrida Shukriya, for that village lies on its route.

constantly available. None of the problems encountered were absolutely insurmountable, but some proved more of an inconvenience than others.

1.4.4 Reliability Of The Data

One problem, unmentioned in the previous section but which requires closer attention, is the truthfulness of the answers given, which raises the question of the reliability of the data received. Due to the precautions outlined in the previous section, it was felt that the majority of the answers given were of a truthful nature, but it was still necessary to establish certain checks upon the data received from the questionnaires. While it is difficult to check the demographic data, it has some degree of inbuilt cross-checking: for example, if the age of the wife is given as 27 and that of the son or daughter as 17, one of the ages given, at least, is wrong. Similarly, prices received for the crops can be checked against each other, and against information from government departments relating to crop prices, while a check on income operated within the questionnaire, through separate questions relating first to total income, and second, to the individual components of that total.

In one definite respect, however, the information obtained should be treated with caution: namely, in relation to livestock. The main fear of the interviewees stemmed from the fact that the ownership of livestock in the Sudan is taxed according to the number of head of livestock an individual owns, so that they were afraid that any answers they might give would find their way into government hands. Despite repeated assurances to the contrary, attitudes concerning questions about livestock could only rarely be changed. However, this attitude was confined largely to absolute numbers of livestock owned, and consequently, it is maintained that information relating to actual ownership of livestock is generally of a reliable nature. Apart from data received in this context, however, its reliability is generally accepted: this feeling was reinforced by the

allowed their transport to be used if their routes coincided with the author's destination (30). Neither form of transport was particularly satisfactory, as they did not allow sufficient flexibility. It should be stressed, however, that the problem of transport is not unique to Khashm el Girba, but is present throughout the country (31).

The problems relating to the questionnaire were less frustrating and more easily overcome. The main problem was the availability of interviewees during daylight hours, because many of them were at work in their fields, or elsewhere outside the village, for much of the day. Consequently, much of the questionnaire was conducted in the early morning, or just before sunset, with the exception of Fridays, the holy day of Islam, when inhabitants were more readily available. More serious in nature was the refusal or reluctance of certain people to answer the questionnaire, but in practice, only 2 outright refusals were encountered, and, although certain others took some time to convince, they eventually concurred. Again at a practical level, the questionnaires were not implemented as quickly as possible at times, due to 2 main factors: the propensity of both interviewer and interviewee to get side-tracked into discussion; and the frequent interruptions from observers, which in turn also led to long discussion. This was more of an inconvenience than a problem.

One of the main problems relating to the implementation of the questionnaire concerned the interpretation and definition of specific points. As the fieldwork assistants became more proficient such problems diminished, but to counter any such difficulty, the author made himself

(30) For example the Health Department landrover was used to reach Umrahau, and a Local Government landrover to reach Wad Nabar.

(31) For example the Ministry of Agriculture: Agricultural Reform Corporation report on Dueim (1974, in arabic) states: "There is a shortage in the number of cars; the number at present is below average, which makes communication in the field inadequate".

comments of the fieldwork assistants, who stated that they felt that truthful answering had generally taken place.

Finally, data from official sources, as with any such information from the Third World, must be regarded with some reservation, but in the case of Khashm el Girba reliable records have been kept since the scheme's inception. In the absence of any material by which the information, thus obtained, could be cross-checked, the information has to be utilised, and, for the purposes of the survey, will be regarded as reliable.

CHAPTER TWO

THE SETTLEMENT OF NOMADS

2.1 The Process Of Settlement

2.1.1 Introduction

In many of the countries of the Middle East and Africa with large nomadic populations, the governments, in striving for development, have generally followed a policy directed at the settlement of such populations. However, the settlement of nomads does not only refer to the forcible or, at the least, encouraged settlement carried out by governments, but has frequently, in the past, and to some extent still does at present, include the natural and voluntary settlement of nomadic groups and individuals due to a variety of external and internal influences. For example, George has estimated for Egypt, that the nomadic population has declined from 110,000 in 1907 to 55,000 in 1972, whilst in Israel the fall has been from between 65,000 and 95,000 in 1948 down to only 14,000 in 1972; a more modest decline is suggested for Syria - from 350,000 in 1940 to 300,000 in 1972 (1).

The factors working to encourage the settlement of nomads may be grouped into 3:

a) Natural forces working both internally and externally against the continuance of the nomadic way of life.

(1) A. R. George (a) "Processes of Sedentarisation of Nomads in Egypt, Syria and Israel", In Geog. Vol. 48, No. 2 1973 p. 107.

b) External influences working to encourage nomadic settlement.

c) Governmental pressures working either to encourage or to enforce the settlement of nomads.

Before going on to discuss the desirability or otherwise of settling nomads, it is intended to examine these 3 sets of factors, and how they have influenced the settlement of nomadic peoples. It must be stressed, however, that while one factor may be responsible for settlement, more often it is the combination of several factors which leads nomads to adopt a settled way of life.

2.1.2 Natural Forces

At the present time, in comparison with the forces present in both external factors and government pressures, the impact of natural forces on the settlement of nomads appears relatively small. In the past, however, it has played a more significant role, and now, in its relationships with the other factors, it has its part to play in the decline of pastoral nomadism. First, mention must be made of the general movement of populations from one mode of living to another, where they believe, or are led to believe, that conditions and their wealth will improve: particularly in Africa, Asia and South America, there has been a general movement towards the capital city from both the smaller urban centres and from the agricultural areas, while in the agricultural areas themselves farmers have moved off the land to go to the small towns of those areas. Similarly, nomads stop their wanderings to settle down in a permanent place and take up settled agriculture. Such a process is, in all cases, a manifestation of the desire of a man to better himself and make things more comfortable for his family, and, as such, has had a long history. As a rule the process works gradually, but need not necessarily do so, and this has been particularly true for the nomad during periods of extreme, harsh environmental conditions. Bisson suggests that a drought

could force the Reguibat of North Africa to slaughter and sell many of their animals, which could result in their relinquishing their way of life (2). Similarly, Bataillon, referring to the Algerian Sahara, says that the most common cause of settlement is the brutal loss of herds, and cites the example of 1947, when three-quarters of the oxen around Souf and Nefzoua, and 90 per cent of the oxen and 50 per cent of the camels around Laghaout were lost through drought, which led to the influx of nomads into the administrative centres for help (3). Thus, although the nomadic way of life is conditioned to harsh environmental conditions, if extreme conditions occur, many are unable to continue the nomadic way of life, and are forced to settle down to achieve greater security. However, the process can work equally well in reverse, for, once extreme conditions have passed, many former nomads return to their traditional way of life, as Bataillon remarks in Algeria:

> ". . . . . the extreme variety in the conditions of settlement depends on agricultural conditions and the internal traditions of the tribe: thus the Chaamba look after their cohesion during sedentarisation, find new resources and adapt themselves with a remarkable flexibility, while the Rebaia of Souf remain together but only to acquire more animals and return to the traditional way of life". (4)

Inevitably there will be an overall loss to settled life, as some will be attracted to its greater security, and arguably greater wealth (5), and such a trend is likely to continue as conditions in settled agricultural areas themselves generally improve.

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(2) J. Bisson "Nomadization chez les Reguibat L'Guacem". In UNESCO (a) Arid Zone Research Series Vol. XIX 'Nomades et Nomadisme au Sahara', Paris, 1963 p. 58.

(3) C. Bataillon "Resistance ou Decadence du Nomadisme". In ibid. pp. 145-6.

(4) Ibid. pp. 148-9.

(5) The figures presented in Bataillon (op. cit.) suggest that in Laghaout the nomad is better off than the sedentary farmer, while the semi-nomad is better off than both.

A further point has been raised by Barth in his work on the nomads of South Persia (6), where he suggests that a two-fold check on nomadic populations operates to encourage the settlement of nomads, so that the balance between herd size, available pasture and population size can be maintained. Thus, at the top end of the scale, as wealth is accumulated through the acquisition of more and more animals, so is the risk of the loss of this wealth through stealing, etc increased: consequently, investment gradually moves away from the animal resources to be replaced by the land, and although the nomads who acquire land and thus become landlords do not at first settle down, the encouragement to do so increases as more land is acquired, and in such a way a certain proportion of the population are drawn into the sedentary way of life (7). At the other end of the scale there is a minimum herd size for an individual beneath which it is impossible for him to subsist, for,

> ". . . . . the productive capital to which their subsistence is based is not simply land, it is animals - in other words food. A pastoral economy can only be maintained as long as there are no pressures on its practitioners to invade this large store of food. Once it has been consumed, the population can no longer pursue a pastoral subsistence". (8)

Thus, the only answer for a nomad brought into such a position is to settle down, because his whole basis for nomadic existence has been removed.

2.1.3 External Influences

Until recently, nomadic peoples have tended to dominate their settled brethern: the Mongols overran China, and the downfall of the civilisation of Mesopotamia was attributed to repeated nomadic incursions.

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(6) F. Barth "Nomads of South Persia: The Basseri Tribe of the Khamseh Confederacy", London, 1961.

(7) Ibid. pp. 43-4.

(8) Ibid. p. 124.

But, with the arrival of a more centralised and efficient authority, the nomads' power has declined. Such centralised authority is particularly identified with the colonial period in much of Africa and the Middle East, but the presence of Europeans had far greater effects on the traditional nomadic way of life than through political control alone. The arrival of the Europeans, with their superior technology and science, has altered the nomadic existence in an economic, social and ecological sense, as well as in a political sense, and this trend has been continued since the countries of Africa and the Middle East achieved their independence, combining to bring about a general decline in nomadism, largely through the settlement process.

In the economic sense, the arrival of the Europeans diminished the sources of income upon which the nomads formerly depended. This was effected through increased political control and through greater economic power. In the area of French influence in north and west Africa, the presence of strong government led to the disappearance of the 'brotherhood tax', as the central government was itself demanding taxes from settled and nomadic peoples alike, and the protection the nomads formerly offered to the farmers was no longer theirs to offer (9). In effect the tax the settled population was paying to the government had replaced the 'brotherhood tax' - and incidentally, probably also served the same purpose. Furthermore, the traditional nomadic practice of increasing herd size wherever possible, both as a sign of wealth, and also as an insurance policy against drought, was usually punished by taxes (10). Another source of income for many nomads also disappeared when the Europeans

(9) R. Capot-Rey "The Present State of Nomadism in the Sahara". In UNESCO (a) Arid Zone Research Series Vol. XVIII 'The Problems of the Arid Zone: Proceedings of the Paris Symposium', Paris, 1962 p. 304.

(10) J. Swift "Disaster and a Sahelian Nomad Economy". In D. J. Dalby and R. J. Harrison Church (eds.) 'Drought in Africa: Report on the 1973 Symposium', London, 1973.

brought with them motorised transport, which has fairly rapidly replaced the traditional caravans, run by nomads across the Sahara (11), while the recent discoveries of oil in considerable quantities, providing employment with high wages, has undoubtedly attracted some nomads to settle down and work in the industry:

> "Industralisation played a decisive part in the settling of 5,000 Mekhadma of Ouargla. Owing to the demand for manpower which followed the discovery of oil, the Mekhadma settled around the Ouargla oasis, which was an employment centre". (12)

Effects on traditional social relationships have been equally as widespread: in many cases the tribal chiefs have been employed by governments as local bureaucrats whose job it is to collect taxes, which has had the two-fold effect of demeaning the leaders themselves, but also of lessening their standing amongst their nomadic brethren (13). At the other end of the scale, the arrival of the Europeans saw an acceleration in the decline of slavery among nomadic groups: although the decline had probably begun before the arrival of the colonial powers, they undoubtedly had the effect of encouraging and facilitating the trend. Bataillon quotes the example of a group in Kel Antessar where 90 per cent of the population were originally slaves and says of them:

> ". . . . . frequently the slaves have acquired the manners, ideals, etc of their masters, so that when they acquire freedom, they do not return to their original way of life, but try to equal and compete with their former masters". (14)

Undoubtedly the overall effect of these external influences has been to weaken traditional social relationships within nomadic groups.

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(11) R. Capot-Rey op. cit. pp. 304-5.

(12) V. Monteil "The Evolution and Settling of the Nomads of the Sahara". In I.S.S.J. Vol. 11, 1959 'Nomads and Nomadism in the Arid Zone' p. 580.

(13) R. Capot-Rey op. cit. p. 305.

(14) See over.

However, external factors have affected traditional nomadic societies, encouraging their settlement or partial settlement, in other ways. This is true of both the colonial and the post-colonial periods, particularly with respect to the relationships of nomadic groups to their environment, upon which their whole economic, social and political organisation is based.

Within areas of nomadic activity 2 factors have worked to increase pressure on existing grazing resources. Particularly since the Second World War, but in existence prior to that, the provision of veterinary services has vastly improved, leading to far less incidence of disease, as more animals have been vaccinated. This is a process which has continued into the period of independence and has resulted in far higher livestock populations, as is demonstrated for the Sudan in Table 2.1. These higher populations have increased the pressure on existing grazing resources, particularly as these have not expanded, and indeed, in many areas have diminished. Allied to this has been the increased provision of permanent or semi-permanent water supplies through boreholes, haffirs (15) and wells. Because water supply in such centres is more reliable, nomads take their livestock there for long periods, with the result that the land around them becomes seriously overgrazed. This has been noted in the Sahel by

(14) C. Bataillon "Le Modernisation du Nomadisme Pastoral". In UNESCO (b) op. cit. p. 171.

He says of a former slave group in Kel Antessar, that they have divided into 3 groups:

a) One consisting of 254 persons (68 per cent of them slaves), comprising former masters and former slaves, owning a large number of livestock.

b) One consisting of 451 old slaves who have become pastoralists.

c) One consisting of 104 old slaves who have become cultivators.

(15) Haffirs are hollows dug in the ground to collect rainwater so that it can be stored for a considerable period, rather than run to waste.

Table 2.1. The increase in the livestock populations of the Sudan. 1947 - 1975.

	1947	1956	1966	1975
cattle	4,000	6,416	9,102	14,000
sheep	5,500	6,946	8,660	12,000
goats	5,000	5,788	6,854	9,000
camels	750	1,410	2,000	3,000

All figures are in 000 head.

Figures for 1947 are taken from S.G.J.Bennett, E.R.John and J.W.Hewson. "Animal Husbandry." in J.D.Tothill(ed). Agriculture in the Sudan. London. 1948.

Figures for 1956 and 1966 are taken from Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Figures for 1975 are taken from African Development. Sudan Special. January. 1975.

Baker (16) and Swift (17), where inadequate planning and research is largely blamed, and by Doxiades and associates in the Kordofan Province of the Sudan, where large areas of "extreme grazing pressure" and "heavy grazing pressure" were noted around the main watering points of El Obeid and Abu Zabad (18). Fadlalla remarked on the same phenomenon occurring elsewhere in the western part of Sudan:

> "The government has recently installed water in large quantity in forms of haffirs and borewells to the area. This has led to a vast increase in animal population through immigration from less attractive neighbouring points creating overconcentration and overstocking, the result of which is the eradication of the perennial palatable species and the domination of the less palatable annual species. Tree and plant cover are completely removed and the carrying capacity decreased". (19)

The combination of both factors has led to overgrazing, which has meant that the nomads' livestock is "weak, yields less and is more susceptible to disease", (20).

Undoubtedly the pressures exerted against the nomads not to continue their migratory existence cause many to leave and enter what is perhaps the greatest single threat to the continuance of nomadism, namely, the extension of agriculture into nomadic grazing areas. For, as population increases so does the pressure on existing land, and though this is also true of nomadic populations, 2 factors combine to make the extension of

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(16) R. Baker "The Need for Long-Term Strategies in Areas of Pastoral Nomadism". In D. J. Dalby and R. J. Harrison Church op. cit.

(17) J. Swift op. cit.

(18) Doxiades and Associates "Land and Water Use Survey of Kordofan Province in the Republic of the Sudan", Vol. 1 Dox-Sud A58, London, 1966.

(19) F. A. Fadlalla (b) "The Camel-Owning Nomads of Western Sudan", Dept. of Geography, University of Khartoum, 1972 p. 22.

(20) A. P. Dewan "Report on Community Development in the Sudan", Khartoum, 1965, mimeographed (report not cleared by the UN Technical Assistance Operations), p. 39.

agricultural land more likely than that of grazing land. The growth rate of settled populations has been shown by Henin for the Sudan to be greater than that for nomadic and semi-nomadic populations (21), which means greater pressure on agricultural land. But this factor on its own would cause a very slow decline in grazing land, were it not for the existence of a relatively strong government, whose sympathies lie more with the settled agriculturalist than with the needs of the nomadic pastoralist, largely because the settled farmer produces more per unit area than the pastoralist. Consequently, agricultural land is continually gaining over grazing land, and this has a two-fold effect: first, it attracts nomads to abandon their migratory way of life; and second, the "area available for grazing is being continually reduced" (22), with the inevitable consequence of overgrazing on the remaining land. The Butana plain in eastern Sudan provides a good example of such a process, being subjected to an attack from 3 sides: in the south there has been an expansion in the area under mechanised crop production around Gedaref; in the east the Khashm el Girba scheme has deprived the plain of some half a million feddans of grazing land; and in the west the Rahad scheme will diminish the grazing area by a further 450,000 feddans (23). In all these areas, although grazing is allowed on the stubble of the crops, the livestock are not allowed in the area until after the final harvest, and furthermore, many of the settled

(21) R. A. Henin (a) "Fertility Differentials in the Sudan (with reference to the nomadic and settled populations)", PhD Thesis, London, 1966 p. 195.

(22) H. R. J. Davies "Nomadism in the Sudan: Aspects of the Problem and Suggested Lines for its Solution", In Tijd voor Econ. en Soc. Geog. Vol. 57, No. 5, 1966 p. 200.

(23) Republic of the Sudan, Ministry of Finance and Economy, Roseires Pre-Investment Survey - Report No. 2 Rahad Project Vol. IV Agriculture. Huntings Technical Services Ltd, London, 1965 pp. 11-12.

agriculturalists prefer to graze their own animals on the stubble rather than allow nomads' livestock on it (24). A further point which must be borne in mind is that such agricultural expansion does not affect pastoral nomadism in these 2 respects alone, but it may also bring about an alteration in the traditional migratory patterns of nomads, which leads to a further disruption to the established system. But agricultural expansion can work more directly to encourage the settlement of nomads: apart from encouraging them to take up sedentary farming, it can also create a demand for labour which the nomad can help to fill. Amongst other factors working in North Africa, such agricultural expansion has:

> ". . . . . caused tens of thousands of nomads to abandon their former way of life and to become labourers, gradually settling down to live in the vicinity of their work". (25)

Many of the influences outlined above will not of themselves cause the settlement of nomads, but where other pressures are present, such as from a government or a natural disaster, they will greatly facilitate such a process, and consequently, must be viewed as important factors in the question of the settlement of nomads.

2.1.4 Governmental Pressures

All the above factors have aided in the general decline of pastoral nomadism, but in recent years in particular, governments have attempted to accelerate this trend through the encouragement, and, in some cases, the enforcement of settlement. This has been especially prominent since the countries of the Middle East and Africa have achieved their independence, for under colonial rule, although political control was strong, the general

(24) H. R. J. Davies op. cit. p. 201.

(25) J. Berque "Introduction to Nomads and Nomadism in the Arid Zone", I.S.S.J. Vol. 11, 1959 p. 493.

attitude towards nomadic groups was placatory (26). Under the independent regimes, however, the settlement of nomads has become an important issue, as, for example, Henin says of the Sudan:

> ". . . . . the avowed policy of the Sudan Government is directed towards the settlement of the nomadic part of the population". (27)

and George of Egypt:

> ". . . . . Government policy is to settle the nomads, both because they are regarded as anachronistic in a modern state, and as a means of integrating them socially and economically into the broader society outside the tribe". (28)

Not that government-directed settlement has been restricted to the post-war period. In both Russia and Iran large-scale schemes were implemented to settle nomadic groups before the Second World War. The Soviet Union followed a policy of 'denomadisation' in the steppes around the Caspian Sea, and in Central Asia, which had the effect of:

> ". . . . . total settlement (through the development of irrigated prairies) or a combination of cultivation and organised migrations, the latter being entrusted to brigades of herdsmen". (29)

In Iran mass settlement was attempted during the reign of Reza Shah between 1925 and 1941, because:

> ". . . . . the tribes were viewed as an anachronism in the modern state for which the Shah strove". (30)

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(26) I. A. Gillespie "The Nomads of the Sudan and Their Livestock in the Twentieth Century", in S. Journ. of Vet. Sci. and An. Husb. Second Vet. Conf. on "Sudan Animal Wealth - Present and Future" (held 17-19 December 1965) Vol. 7, No. 2 November 1966 p. 13.

(27) R. A. Henin op. cit. p. 17.

(28) A. R. George (b) "Egypt's Remaining Nomads". In M. E. Int. July 1974 p. 26.

(29) R. Capot-Rey op. cit. p. 307.

(30) E. Sunderland "Pastoralism, Nomadism and the Social Anthropology of Iran". In W. B. Fisher (ed) (b) The Cambridge History of Iran, Vol. 1 'The Land Of Iran', Cambridge 1968 p. 641.

The policy included the forcible settlement of nomads miles from their tribal lands and the blocking of their traditional migration routes, both of which caused much hardship and death amongst both the human and the livestock populations. As Lambton says, the policy was "ill-conceived and badly executed" (31), and following the Shah's abdication the policy was reversed.

At present, however, settlement policies tend to be based less on force and more on encouragement, and the I.L.O. has now formulated a convention to that effect:

> "Recourse to force or coercion as a means of promoting the integration of these populations (ie nomadic populations) into the national economy shall be excluded". (32)

An example of how encouragement and subtle persuasion can work to settle nomads is presented by Calder writing on Egypt:

> "We passed Arab encampments and Milad Bey pointed out something significant - that in the middle of Bedouin tents they were beginning to settle. The secret lies in the olive and fig trees, which have been introduced by the authorities and presented to the Arabs. It is a persuasive device for making the Arabs stop wandering. By age-old habits, the Bedouin of that area, as in the rest of the desert, would plough, or rather scratch up, a bit of land, sow his barley, wander off and return to harvest the crop. But give him a tree and impress upon him that it is his and must not be cut down, and he will jealously guard that tree and its fruits; and while he is sitting waiting for his fruit to grow, he will - as he is doing in this area - begin to till the ground around it. Gradually he becomes a fixture, a tiller rather than a wanderer". (33)

Other governments, too, are beginning to become active in encouraging settlement, largely through irrigation or ranching schemes, be they on a small or large scale, but it remains now to examine why the governments of

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(31) A. K. S. Lambton "Landlord and Peasant in Persia , a study of land tenure and land revenue administration" London 1969 (first printed Oxford 1953) quoted in E. Sunderland op. cit. p. 643.

(32) I.L.O. Convention 107, Article 3, Item 4, Author's parentheses.

(33) R. Calder "Man Against the Desert", London 1951 p. 100.

such countries and other official bodies such as the United Nations and the I.L.O. regard as desirable the settlement of nomads, and, equally, why in some instances such settlement may not be desirable.

2.2 The Settlement Of Nomads: The Arguments

2.2.1 Introduction

There appears to have arisen a division of opinion concerning the desirability or otherwise of settling nomadic and semi-nomadic populations amongst authorities concerned with development and development policies: on the one hand there is the view advocating settlement, while on the other hand there is the view which favours the continuance of the nomadic existence. The arguments presented by both sides involve economic, social, political and environmental considerations, and it is felt worthwhile at this stage to outline the various contentions presented.

2.2.2 Political Arguments

The political arguments against nomads and for their settlement may conveniently be divided into 2:

a) The Difficulty Of Administration And General Political Control. With peoples who are continually on the move, or who are moving for most of the time, the provision of adequate administrative facilities becomes very difficult. Consequently, taxes are difficult to collect, and the upkeep of law and order virtually impossible for an external authority - although the nomads themselves maintain a law and order in tune with their society, and work it efficiently internally (34). This may be a particularly tricky problem in border areas where such activites as gun-running and smuggling may take place. As illustration, in the Sudan, with its vast mileage of borders, control throughout their length is impossible, and the smuggling

(34) See, for example, T. Asad (a) "The Kababish Arabs: Power, Authority and Consent in a Nomadic Tribe", London 1970.

of animals, particularly camels, to Egypt, and wheat to Chad and Ethiopia, continually takes place. Such instances not only represent a political problem, but they also mean an economic loss, for the money or goods received in exchange for the smuggled commodity only slowly find their way into the economy of the country. Furthermore, the political strength of certain nomadic groups represents a threat to the government of the country they inhabit, as it is unable to extend its control over them. Examples include the Kurds of Iraq and Iran, and the Somalis of north-east Kenya. Finally, however, it must be remembered that these points relate to certain nomadic groups only, and cannot be applied to nomadism in general.

b) The Accusation Of Tribalism. It has been remarked that nomads are more conscious of tribal than of national ties, and while this may be true in many cases, the criticism must be treated warily, for it is an accusation that has been levelled at many societies in Africa, be they sedentary or nomadic, and cited as a barrier to development. While this does not negate the problem, it shows that it is one which is not unique to nomadism. Closely connected with this feeling is the idea, commonly expressed, that nomadic life is a barbarous and backward existence which is anachronistic to a state trying to achieve development during the middle of the twentieth century (35).

2.2.3 Economic Arguments

Arguments based upon economic lines can be found to substantiate both the continuance of nomadism and the encouragement of its decline. Nomadism, as an essentially subsistence mode of existence, is often considered as being unable to contribute greatly, if at all, to the economy of a country,

(35) T. Asad, I. Cunnison and L. G. Hill "Settlement of Nomads in the Sudan: A Critique of Present Plans". In D. J. Shaw (ed) 'Agricultural Development in the Sudan', Procs. of the thirteenth annual conf. of the Phil. Soc. of Sudan, Vol. 2, Khartoum 1966 p. 102.

and indeed is usually considered as being more of a burden than an asset. This is largely because nomads lack a commercial attitude towards their livestock, being more concerned with quantity than quality, and not being particularly keen to part with animals, as, amongst many groups, they have a social and political significance apart from their economic value (36). However, this is not necessarily true of all nomadic groups, as Asad says:

> "The Kababish economy is not strictly a subsistence one, since they export annually large numbers of animals to the outside world". (37)

In addition, in several countries livestock make an important contribution to export earnings, and in such countries the majority of the livestock is in the hands of nomads or semi-nomads, so that the decline of nomadism would be a serious economic loss to the countries concerned (Table 2.2). Furthermore, in many countries where livestock do not contribute to exports, they provide sufficient produce to meet most of the demand from the domestic market. The economic arguments are not, therefore, clearcut, but depend to a great extent upon conditions pertaining in a particular country.

2.2.4 Social Arguments

It is perhaps through social arguments that protagonists of the view for the settlement of nomads make their most valid and soundest points. The nature of nomadic movements makes it extremely difficult to provide what are accepted as the essential social services necessary to accompany development, especially those of health and education, the former referring to both the human and the animal populations. This is, to a certain extent, true, but in recent years the provision of health facilities for livestock

(36) Ibid. p. 105.

(37) T. Asad (b) "Seasonal Movements of the Kababish Arabs of Northern Sudan". In E. P. Skinner (ed) 'Peoples and Cultures of Africa', New York 1973 p. 148.

Table 2.2. The contribution of livestock to the export earnings of selected countries of Africa and the Middle East.

country	total exports	livestock exports	percentage contribution of livestock
Chad	33.6	13.2	39.29
Egypt	825.1	2.8	0.34
Jordan	47.6	0.8	1.68
Mali	41.9	18.3	43.68
Somalia	47.8	34.8	72.80
Sudan	364.0	38.3	10.52
Syria	288.8	18.4	6.37
Turkey	884.9	26.6	3.01

Figures are in millions of US dollars.

Source: F.A.O. Trade Yearbook. 1973. Vol. 27. Rome. 1974.

has greatly improved, and has been largely utilised by the nomads who have recognised its value to them. On the other hand, the adoption of education has not been so readily accepted in some places: the Humr of Kordofan Province, Sudan are selective in their adoption of certain innovations:

> ". . . . . for example the schooling of children, which would interfere with their training in nomadic techniques is largely rejected, while they have accepted other things, which would not change their basic way of life, but would rather make their old way of life better than it had been: examples are the acceptance of veterinary services for improving health and standard of cattle; cultivation of cotton whose proceeds go to increase the size of herds, and short trips to towns to earn cash for starting a herd". (38)

Undoubtedly, however, the provision of health and education facilities is rendered much easier when the population concerned is settled, both because of obvious practical reasons, and also perhaps, because attitudes amongst settled populations would be more favourable. Although, therefore, an administrative problem, the lack of education and health facilities amongst nomadic groups may well also be detrimental in social terms.

However, these arguments ignore the possibility that the social structure of certain nomadic groups may be unsuitable to the concept of settlement, and that therefore, attempts to settle them would be equally as socially harmful as their lack of adequate social facilities. Such a situation has been claimed for the Baggara Humr of western Sudan (39).

2.2.5 Environmental Arguments

One of the frequent criticisms of the nomadic way of life is that it often misuses its environment:

> "Nomadic herders themselves have overexploited their meagre resources of the desert fringe". (40)

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(38) T. Asad, I. Cunnison and L. G. Hill op. cit. p. 114.

(39) Ibid. p. 11.

(40) D. Grigg "The Harsh Lands: A Study in Agricultural Development", London 1970 p. 175.

Such a view is substantiated in the case of Saudi Arabia in an unpublished F.A.O. report (41), which gives the following proportions for various classifications of grazing land:

Excellent		5 per cent
Good	(50 - 75 per cent original product plants present)	10 per cent
Fair	(25 - 50 per cent best forage plants present)	25 per cent
Poor	(less than 25 per cent production plants present)	60 per cent

On the other hand there is the view that many nomadic groups utilise lands which cannot be utilised in any other way, and while this may not be true of all nomadic groups it is certainly true of a considerable proportion. In addition, it is also held by some authorities that nomadism is in itself a rational land use form:

> "Although the use of arid lands by nomadic herdsmen has been disliked by government officials, social reformers, and numerous economists, there are ecologists and some economists who view ecologically intelligent pastoralism as the most efficient and productive use of most arid lands". (42)

Consequently, as with the economic arguments, there appears to be no definitive answer concerning the desirability of the settlement of nomads in environmental terms. Indeed, the main grounds for considering the settlement of nomads desirable appear to be administrative and social, but in only certain conditions and instances do economic and environmental arguments support them. Nevertheless, the governments of the Middle East and Africa seem committed to the policy of settlement, but in spite of this the success of such policies has been fairly limited.

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(41) F.A.O. Report to the Government of Saudi Arabia on grazing resources.

(42) L. K. Caldwell "Environment and Administration". In W. W. Murdoch (ed) 'Environment: Resources, Pollution and Society', Stanford 1971 p. 403.

2.3 Alternatives To Settlement

In examining what has become known as the 'nomad problem' 3 related aspects present themselves, not all of which the process of settlement may necessarily answer:

a) What is to happen to the nomads themselves?

b) What is to happen to the nomads' livestock?

c) What is to happen to the land upon which the nomads live and roam?

Settlement may be able to answer the first 2 of these questions, especially where livestock are integrated within the proposed schemes, although in many such schemes this is not the case, and where it is so, the nomads themselves make adaptations which involve the combination of livestock rearing with settled agriculture. But usually, especially in marginal areas, settlement schemes involving agriculture use only a proportion of the land previously devoted to pastoral nomadism, because by its very nature settled agriculture under irrigation or other modern conditions uses land more intensively than pastoralism. Consequently, in theory, such a solution leaves a large proportion of land under-utilised, although in practice, because settlers on a scheme are able to make adjustments to incorporate their interests in livestock into an overall framework including settled agriculture, usually run on commercial lines, the land brought under cultivation is still utilised for grazing purposes. This point will be elaborated upon with reference to the settlement of nomads on the scheme at Khashm el Girba later in the thesis.

If utilised in conjunction with some other suggested solutions put forward, however, settlement may be able to present a solution to all aspects of the question. The most obvious alternative to ignoring the remaining land would be to introduce some form of ranching system, which would utilise both the animal resources and the natural environment, perhaps more rationally and probably more economically than the traditional

system. The conflicting arguments for commercial ranching as opposed to pastoral nomadism are well outlined by Harrison:

> "A large sheep station in Australia occupies the same area of country as a moderate tribe may possess in the Sudan. Instead of all the people of the whole tribe there is merely the owner of the station and a few hired hands. The income from the animals is divided into a good profit for the owner and good wages for the labourers. A good standard of living is enjoyed by all. The members of the tribe are far more numerous so that there is far less cash per person, and they have to rely largely on animals for their food. Which is the more efficient? The sheep station is more efficient in that a higher standard of living is enjoyed. The tribe is more efficient in that a greater number of people are supported. What would be done with the members of the tribe, with the people, if ranching displaced tribal life?" (43)

The obvious answer to the final question raised by Harrison is to settle them in an agricultural scheme. In some countries a ranching system has been attempted, but the results vary considerably. In Angola, de Carvalho suggests that the ranching pattern adopted there is at best, only as efficient in economic terms as the traditional pastoral system based upon a semi-nomadic existence (44), while in Kenya organised ranching has generally helped to commercialise livestock production. Other suggestions cannot usually be applied generally, but must be restricted to specific conditions: el Tayeb, for example, suggests that forestry would be a more economic alternative in certain areas (45), while Riney puts forward wildlife management as a realistic alternative (46). On the other hand

(43) M. N. Harrison "Report on a Grazing Survey of the Sudan", Khartoum 1955, mimeographed, irregular pagination.

(44) E. C. De Carvalho "'Traditional' and 'Modern' Patterns of Cattle-Raising in Southwestern Angola: A Critical Evaluation of Change from Pastoralism to Ranching". In J. D. Areas Vol. 8, No. 2, January 1974 pp. 222-3.

(45) G. D. el Tayeb "Forestry and Land Use in the Sudan", Khartoum 1973.

(46) T. Riney "Wildlife Management and Nomadic Stocks in Semi-Arid Lands". In 'Land Reform: Land Settlement and Co-Operatives', No. 1, F.A.O. 1971.

it may be better and less costly, socially and economically, to try and adapt the existing skills and knowledge, which the nomad has of his environment, to a more modern and commercial outlook. This was suggested by Doxiades and Associates for the Baggara tribes of Kordofan in the Sudan (47), while it is difficult to disagree with Johnson when he says:

> "Only by striving to co-ordinate modern technology with traditional pastoral land use systems, whose validity is sanctioned by long historical survival, can regions too marginal for agriculture continue to be important contributors to contemporary national growth and development". (48)

The settlement of nomads is, however, the prime objective of most governments with significant nomadic populations, and other suggestions may only be of use in conjunction with settlement, and in particular environmental conditions. But such alternatives should not be entirely ignored, where they may be of value.

2.4 The Settlement Of Nomads In The Sudan

In general, in the lesser developed countries of Africa and the Middle East the settlement of nomads on a large-scale has not been particularly successful. The one exception to this appears to have been the Sudan, where schemes such as the Gezira, and to a lesser extent, the Gash and Tokar delta schemes, have involved the successful settlement of large numbers of nomads:

> "A considerable number of semi-nomads, who rear animals, as well as grow crops, have been persuaded to abandon their migrations and to settle down as tenants and labourers on irrigation schemes". (49)

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(47) Doxiades and Associates op. cit.

(48) D. L. Johnson (b) "Ecological and Historical Factors in the Pastoral Nomadism of Eastern Cyrenaica". In Colloque de Ouargla, held 25th - 26th September 1971, 'Les Problemes de Developpement du Sahara Septentrional', Annales Algeriennes de Geographie, No. Special, May 1972 p. 139.

(49) H. R. J. Davies op. cit. p. 200.

But the Sudan has itself experienced failures in settling nomads:

> "There was the ambitious and well-planned LS 600,000 scheme to resettle semi-nomadic Dinka tribesmen on a large-scale agricultural scheme where their enormous herds of cattle could be marketed, which reportedly attracted only 50 families in a year". (50)

And even the schemes at Gash and Tokar have not managed to encourage total settlement:

> "They (the Hadendowa nomads) occupy both the Gash and Tokar deltas, where, as landlords, they receive the profits of cotton-growing, after hiring labourers to do their work. They spend their income upon animals and pleasures". (51)

Indeed, Lebon comments further that:

> ". . . . . only a few small tribes, mainly in the Gezira, have changed fully from pastoral nomadism to sedentary cultivation. But more have found profit in grafting some form of cultivation onto nomadism". (52)

This is not to say that such a process is necessarily bad: indeed, it probably makes the transition from nomadism to agriculture much easier in the long run.

By and large, however, the Sudan has managed to settle, partially or wholly, significant numbers of nomads through many of its agricultural schemes, including, besides the Gezira and its Managil Extension, the many pump schemes along the Nile and its tributaries. Such schemes were not devised as settlement projects, but were rather devised to further agricultural development. Indeed, because of the ubiquitous nature of nomads in the Sudan, almost every agricultural scheme is bound to involve the settlement or displacement of peoples of nomadic origin. The pump schemes were initiated by both the government and private firms and individuals, and tenancies offered. Inevitably, certain numbers of the nomads whose

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(50) C. Eprile "War and Peace in the Sudan", 1955-72, London 1974. Referring to an article in the Washington Post - 27th June 1971.

(51) J. H. G. Lebon "Land Use in Sudan", World Land Use Survey, Monograph No. 4, Bude 1965 p. 114.

(52) Ibid. p. 105.

land had been taken were attracted to the scheme, thereby enabling settlement to take place. Undoubtedly, the success of such settlement was helped by the semi-nomadic nature of the populations involved, and this is equally true of the populations of the Gezira and Khashm el Girba schemes. In areas where the nomads are further along the continuum to pure nomadism, such as the Kababish and some of the Baggara tribes, settlement has proved more difficult. In northern Kordofan there has been an attempt to settle Kawahla and some Kababish nomads in a co-operative scheme at a place called Jiraih es Sirha. This was set up in 1969, and an area enclosed to provide dry-season grazing for the livestock, around which were established 3 villages, each containing about 50 families. The scheme was also provided with a school, and its economic base was to be milk production, but indications so far suggest that the scheme has been a failure (53).

Inevitably, the Sudan, with such a high proportion of its population being classified as nomadic (54), feels particularly the need to settle its nomads, especially as the bulk of the country's vast livestock wealth is still in the hands of the nomadic population, and consequently, much of it remains underutilised or unutilised for the purposes of the country's economy. Many of the nomads who have settled did so during the period of British administration, under such projects as the Gezira Scheme and the Alternative Livelihood Schemes along the Nile and its tributaries, but the

(53) Information about the scheme at Jiraih es Sirha comes from 2 sources:

a) F. A. Fadlalla "A Scheme Report on Jiraih es Sirha Rural Development Scheme", University of Khartoum 1972.

b) Personal communication with Musa Salim Sahil, former Inspector of Local Government in Dar el Kababish, where the scheme is located.

(54) See page 24.

various independent governments since 1956 (55) have made steps along the same direction, with the instigation of other pump schemes along the Nile (56), the scheme at Khashm el Girba, and the Rahad scheme, which is now in its initial stages. In fact, in the autumn of 1973 a special department was established in the Ministry of Local Government, Housing and Community Development to deal specifically with the settlement of nomads.

The scheme at Khashm el Girba was really the first large-scale agricultural project undertaken by an independent Sudanese government, if Managil is taken as being a mere extension to the Gezira, and until the Rahad Scheme the first and only attempt to settle large numbers of nomads, other schemes being instigated rather as pilot studies such as those at Babanusa and Jiraih es Sirha, or for the purposes of prestige, such as those at Gummuiya and Es Suki (57), and involving relatively small numbers of people. The Khashm el Girba Scheme is, therefore, extremely important to the Sudan, in respect of its performance in settling nomadic populations, and may be of help to the government in attempting to settle more of its nomadic population.

(55) Since 1956 the Sudan has had 4 governments: the first civilian one was overthrown in a coup by General Abboud in 1958. He himself was displaced by a civilian coup in 1964, which in turn was removed from power by Nimairi in May 1969. Since that time Nimairi has remained in power, despite repeated coup attempts.

(56) For example, at Dueim on the White Nile and Zeidab on the main Nile.

(57) African Development, Sudan Special, January 1975.

CHAPTER THREE

THE KHASHM EL GIRBA SCHEME

3.1 Physical Background

3.1.1 Introduction

In this section it is intended to deal with the various physical factors affecting the area, insofar as they have affected the human adaptations to the environment, both in the past (ie the traditional adaptations), and at the present (ie the modern adaptations) (1). For ease of examination the factors will be dealt with in a systematic fashion, although it is recognised that it is only the interactions of the various factors which constitute the overall picture.

3.1.2 Topography

The Khashm el Girba Irrigation Scheme lies on the eastern edge of the extensive Butana plain (2), which is described as "a gently undulating plain" (3) upon which "only a few rocky hills break the monotony" (4). The area of the scheme itself retains these essential characteristics of the whole plain, and slopes almost imperceptibly to the north and east, and is broken only by the occasional jebel, such as those found in the vicinity

(1) More detailed information relating to the physical background of the scheme appears in Appendix B.

(2) See page 32.

(3) K. M. Barbour "The Republic of the Sudan: A Regional Geography", London 1961 p. 215.

(4) J. H. G. Lebon "Land Use in Sudan", World Land Use Survey, Monograph No. 4, Bude 1965 p. 29.

of Saba'at, in the north of the scheme (5). These topographic characteristics facilitated the introduction of irrigation into the area by means of gravity, and have also made possible the mechanisation of agriculture, although the area's sloping nature has necessitated the utilisation of water regulators to control the flow of the irrigation water, and to reduce its velocity (6). Immediately to the east of the scheme, between the edge of the scheme and the Atbara River, the land slopes rather more sharply, and is marked by winding and irregular gullies (Figure 3.1). This type of land is known as kerrib (7), and as such is unsuitable for irrigated agriculture, being classified by the Soil Survey of the Scheme under Land Capability Unit V (8).

Prior to the construction of the dam at Khashm el Girba, the River Atbara had a seasonal flow, with a peak between July and October (9), but even so was an important source of water for the local nomadic and semi-nomadic groups, even though in April and May it might be no more than a trickle (10). It was the seasonality of this flow that necessitated its control by a dam, in order that water passing through the region could be

(5) The name Saba'at is taken from the Arabic 'saba' meaning 'seven', and refers to the group of 7 hills in the vicinity.

(6) G. D. Sid Ahmed (b) "The First Year at Khashm el Girba". In S. N. and R. Vol. 58, 1967 p. 160.

(7) Kerrib land is the broken, uneven land running down to the river from the edge of the plain.

(8) Land Capability Unit V is defined as "land unable to support arable at the present but warranting further investigation".

Republic of the Sudan (d) Ministry of Agriculture, Soil Survey Report of Khashm el Girba Part II 'Khashm el Girba North' (L. H. J. Ochtman) Wad Medani 1965 p. 28.

(9) See H. E. Hurst "The Nile: A General Account of the River and the Utilisation of its Waters", London 1952.

(10) Ibid.

Figure 3.1. The Nature of the Landscape in the Vicinity of the River Atbara

more effectively and more fully utilised. The construction of the dam to the south of Khashm el Girba railway station has duly achieved this, and has, in turn, altered the pattern of the river's flow, with the result that it now runs throughout the year, a situation which has had some relevance to the remaining nomads and semi-nomads inhabiting either side of the river (11).

3.1.3 Geology

The geological structure of the scheme area has fundamentally affected man's relation to his environment in 2 very important respects. First, prior to the inauguration of the scheme, the scarcity of water supplies within the region, and indeed, throughout much of the Butana, made necessary a nomadic, or at the least, a semi-nomadic existence. Such a situation is the direct result of 2 factors: the climate of the region, which will be dealt with later, and its geology. The underlying rocks of the area, and of much of the eastern Butana, are of the Basement Complex (12), and as such afford little opportunity for the collection of underground water. Consequently, much of the Butana is devoid of permanent water supplies, wells occurring only infrequently for example at such places as Sobagh, Sufeiya and Geili (13). The scarcity of such water points is particularly noticeable in the eastern part of the Butana, but in the west, towards the Blue Nile and Rahad rivers, the situation is less serious, for there, wells are more numerous the area being underlain by Nubian Sandstone (14),

(11) These groups include the Shukriya and Rashaida Arabs and many of the Beja tribes.

(12) J. H. G. Lebon op. cit. p. 4.

(13) For example, the Cartographic Survey of Sudan 1:250,000 series. Map 55-D, Reira dated February 1949, says: "large waterhole on top of Jebel Reira, 3 wells to S and S W of highest point".

(14) J. H. G. Lebon op. cit. p. 4.

a geological structure which more easily allows the collection of groundwater. Consequently, the form of pastoralism which has developed in the western part of the Butana is of a less purely nomadic nature than that of the eastern part of the plain (15).

The only solution to such scarcity is the introduction of water from external sources, which is precisely what the introduction of the Khashm el Girba dam and irrigation has provided, and incidentally what will also be achieved in the western Butana by the construction of the Rahad Scheme. However, the scarcity of groundwater supplies still has its effects, despite the introduction of irrigation, because domestic water supplies, in addition to those for agricultural purposes, have to be drawn from the irrigation canals and passed through a filtration system, due to the lack of any supplies from groundwater sources (16).

The other important aspect relating to geology concerns the gorge above the village of Khashm el Girba, whose presence made possible the construction of the dam, by which the waters of the Atbara are controlled (17).

3.1.4 Climate

As was the case with groundwater supplies, climate and, more particularly, rainfall, did not provide sufficient water to allow of a sedentary existence (18), but rather led to the development of pastoralism based upon a nomadic routine, even along the River Atbara, where the water supply was of a more permanent nature, and where a form of semi-nomadism developed. Consequently, with an annual average rainfall in the area

(15) M. H. Abu Sin "The Regional Geography of the Butana North of the Railway", MA Thesis, Khartoum 1970 p. 78.

(16) Personal communication: A.P.C. Khartoum.

(17) Republic of the Sudan (i) Ministry of Irrigation and H.E.P. 'Irrigation by Gravity from the River Atbara' (H. Bell) Khartoum 1956.

(18) For detailed climatic figures see Appendix B.

amounting to 12 inches - 300 millimetres (19) - and a high degree of variability (Table 3.1), for anything less hazardous than pastoral nomadism to develop and be possible, an external water supply was necessary, which was provided by the damming of the river, thus allowing its greater control. In spite of this, however, rainfall remains an important factor in several respects: first, if rainfall is low in Ethiopia, the level of the Atbara flood is reduced, which has the effect of reducing the area of land that can be cultivated. When this occurs the burden of reduced area usually falls on the wheat crop, as both cotton and groundnuts are sown and harvested earlier in the season, and, in any event, cotton has priority of water usage. Indeed, such an occurrence took place in season 1972/73 when the area under wheat was only 62,600 feddans compared with an area of 117,598 feddans in the previous season (20). Second, in years of good rainfall many of the nomadic tenants, who also maintain interests outside the scheme, return to the scheme late, which leads to the crops being sown and harvested at a later date than the optimum, which can in turn lead to lower yields. Such an occurrence was noted for the season 1967/68:

> "Due to the good rainfall, the Arab tenants in Phase II were busy sowing their land outside the scheme and they started to arrive at the scheme by early September". (21)

Furthermore, the rains, occurring usually between July and October, have a serious effect on transport, both within the scheme, and from the scheme to other parts of the country. Because the roads are unmetalled and rarely even gravelled, motor transport is virtually impossible, not merely in Khashm el Girba, but throughout the northern part of the Sudan during the rainy season. Consequently, the only transport available, except for

(19) Personal communication: A.P.C. Khartoum.

(20) Personal communication: A.P.C. Khartoum.

(21) Khashm el Girba A.P.C. (a) "Agricultural Production in Season 1967/68", New Halfa 1968 p. 3.

Table 3.1. Rainfall variability at New Halfa. 1970/71 - 1974/75.

	1970/71	1971/72	1972/73	1973/74	1974/75
June	-	-	117	16	61
July	59	186	51	95	177
August	164	88	106	49	160
total	223	274	274	160	398

Figures are in mm.

Source: A.P.C. Khartoum.

extreme;y limited periods, is by animal (donkey or camel) within the scheme, and the railway for links outside: and during the rainy season even the latter becomes impassable at certain times. Temperature and humidity, for which figures are presented in Appendix B, tend to be of little relevance in either human or agricultural respects.

3.1.5 Soils

Because of the basic uniformity of climate and topography in the area, soil is the main determinant of the ability of the land to support agriculture, and therefore requires fairly close examination. The Butana forms the northern lobe of the vast clay plain which covers much of central Sudan (22), and its general characteristics may be described as follows:

> ". . . . . the top horizon of the soil is a friable clay loam, grey-brown, and usually somewhat pebbly. Beneath is a slightly heavier textured and somewhat darker horizon, beginning about one foot (30 centimetres) below the surface. Small calcium carbonate concretions occur throughout: but there is no gypsum, and little salt". (23)

While it may have been remarked that the soil's fertility is "fairly evident from its natural vegetation" (24), it is not without its drawbacks: Gibb describes it as intractable when wet, although providing good seed beds under dry or moist conditions, when it is readily worked (25). Furthermore:

> ". . . . . the low permeability, the low nitrogen and organic status in all soils of the project area", (26)

restrict "the range of climatically adapted crops that can be grown (on the

(22) See J. H. G. Lebon op. cit. p. 29.

(23) Ibid. p. 48.

(24) I.L.O. Report to the Government of the Sudan on "The Sedentarisation of the Nomadic Tribal Populations of the Butana Region of Northern Sudan", Study Planning Mission November 1963 - February 1964, ILO/TAP/Sudan/R8 Expanded Programme of Technical Assistance (EPTA), Geneva 1965 p. 4.

(25) Sir A. Gibb and Partners "Kassala Province Survey", London 1968 p. 8.

(26) Republic of the Sudan (d) op. cit. pp. 28 - 29.

scheme)" (27). Consequently, the Soil Survey Report for the scheme gives the soils of most of the scheme a Land Capability Unit of IIp (28), which:

> ". . . . . consists of soils which have moderate suitability for crops and pasture, with some limitations for general agricultural use". (29)

These limitations at Khashm el Girba take the form of certain physical characteristics of the soil, which include the tillage problems associated with the clay soils and the low permeability of the soil (30).

However, despite such limitations, the area commanded by the Khashm el Girba Scheme has:

> ". . . . . good soil suitable for all cash crops and extensive lands which can be irrigated by the Khashm el Girba proposed dam". (31)

while it is:

> ". . . . . evident that the following crops give gratifying yields: cotton, kenaf, sunflower, castor seed, sesame, ground-nuts, wheat, barley, millet, maize, broad beans, haricot beans, cowpeas, lubia, phillipesera and sugar cane". (32)

Therefore, except in isolated areas of no great extent (particularly the kerrib land towards the river, which was designated with a L.C.U. of V or VI (33), the soils of the area provide a suitable basis for irrigated agriculture.

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(27) Ibid. pp. 28-29.

(28) See Republic of the Sudan (c) Ministry of Agriculture "Soil Survey Report of Khashm el Girba, Part I Khashm el Girba South" (W. A. Blockhouis) Wad Medani 1965 and Republic of the Sudan (d) op. cit.

(29) Republic of the Sudan (e) Ministry of Agriculture "Soil Survey Report of Khashm el Girba, Phase V and VI Extension" (A. T. Commisaris) Khartoum 1970 p. 14.

(30) Sir A. Gibb and Partners op. cit. p. 8.

(31) Republic of the Sudan (x) W.R.C. File: (S)57/A/2, 1 November 1964 (In Arabic).

(32) Republic of the Sudan (b) Ministry of Agriculture, Department of Agriculture, Khashm el Girba Scheme. Short notes on Khashm el Girba Agricultural Project 29 July 1963.

(33) See page 70.

3.1.6 Vegetation

Prior to the inception of the scheme at Khashm el Girba, the nature of the vegetation in the eastern Butana, and indeed, through the whole plain, was an important factor in determining the nature of the movements of the pastoral nomads, although the seasonal availability of the pasture was itself determined by the nature of the rainfall. The plain is:

> ". . . . . essentially an open grass plain of often heavy soil, with thorn scrub and often abundant kitr". (34)

Harrison (35) and Lebon (36) describe the vegetation in detail, but, apart from being an indicator that the land could support good plant growth, it has been of little relevance in respect to the irrigation scheme, except that, because of the nature of the vegetation, viz "trees and bushes are absent" (37), few costs were incurred in actually clearing the area in preparation for the scheme. In fact,

> ". . . . . practically no costs were involved because the area was open grassland". (38)

3.1.7 Conclusion

The physical environment of the Khashm el Girba area was undoubtedly a fundamental factor in influencing the pastoral nomadic existence of the peoples of the area prior to the implementation of the scheme, but through the introduction of modern agricultural techniques some of the influences exerted by the physical factors have been reduced, although it must be

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(34) F. W. Andrew "The Vegetation of the Sudan". In J. D. Tothill (Ed) 'Agriculture in the Sudan' London 1948 p. 38. Kitr is a thick thornbush which grows over much of the Butana plain.

(35) M. N. Harrison "Report on a Grazing Survey of the Sudan" Khartoum 1965, mimeographed, irregular pagination.

(36) J. H. G. Lebon op. cit. p. 29.

(37) Ibid. p. 115.

(38) M. A. Ibrahim "Factors Affecting the Costing of Irrigation Schemes in the Sudan". In 'Engineering and Development in the Sudan' Vol. 2, Procs of the sixteenth annual conf. of the Phil. Soc. of the Sudan, Khartoum 1966 p. 58.

stressed that the very nature of the environment facilitated rather than hindered the development of the scheme, and still has a not too significant role to play in the present life of the scheme.

3.2 Human Background

Prior to the implementation of the scheme at Khashm el Girba, the area on the eastern edge of the Butana was inhabited by nomads and semi-nomads, coming largely from the Shukriya tribe, but also consisting of Lahawin, Rashaida and other tribal groups, all of whom used the land:

> ". . . . . mainly for grazing camels, sheep and cattle, and some of the land was used for the production of rainfed dura (sorghum vulgaris) which constitutes the staple diet". (39)

Because of the nature of the environment, viz the scarcity and seasonality of water and pasture resources, the tribes had, perforce, to move around. The movements were of an essentially regular nature - what Johnson would describe as pulsatory nomadism (40) - and have been mapped by Lebon (41): at the outset of the rainy season (July), the nomads move with their herds towards the central Butana from the rivers at its fringes, while during the first half of the dry season (from October onwards) they move back to the more permanent water supplies on the edge of the plain. Apart from herding their livestock, however, many also indulge in the cultivation of dura at the end of the rainy season (August to September): the crop is usually sown in the many khors and wadis running across the Butana plain:

> "Shukriya cultivate in the lower parts of the khors draining west from the district south of Jebel Reira", (42)

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(39) M. H. Abu Sin op. cit. p. 147.

(40) D. L. Johnson "The Nature of Nomadism: A Comparative Study of Pastoral Migrations in South-Western Asia and Northern Africa", Dept. of Geography, University of Chicago, Research Paper No. 118, 1969 p. 166.

(41) J. H. G. Lebon op. cit. p. 112.

(42) Cartographic Survey of Sudan 1:250,000 Series, Map 55-D Reira.

while,

> "Wadi el Hasib and Khor Abu Sueid are cultivated throughout their length together with the small wadis flowing into them under various names". (43)

The system of cultivation is known as teras cultivation, and involves the collection of rainwater within small earthen banks, built to a height of between 6 inches and one foot. The dura so planted, is then harvested during the early dry season (November or December), so that some members of the group remain to cultivate the dura, and at the same time look after the camel herds, while the less hardy animals are taken with the remainder of the group back to their traditional tribal centres near more permanent water sites, where they spend the dry season.

Not all groups conform to this pattern, however: the Lahawin move in a north-south direction, parallel to the Atbara river, between the areas of Goz Regeb, Khashm el Girba and Showak (44), while the Butana khut of the Shukriya tribe have exclusive rights to the few permanent watering sites in the central Butana (45). In addition, on the fringes of the plain, notably around Gedaref, and to a lesser extent by the River Atbara (46), a degree of voluntary settlement had taken place prior to the instigation of the scheme at Khashm el Girba, so that life was largely organised on a semi-nomadic basis, with only a proportion of the population of any particular group engaged in looking after livestock and cultivating the rainfed dura. The remainder of the population would stay permanently in villages, many of which, such as Al Gafalla and Goz Regeb, grew up in the late 1950s or earlier (47). It was the population along the River Atbara that was

(43) Ibid.

(44) M. N. Harrison op. cit.

(45) Ibid.

(46) I.L.O. op. cit. p. 25.

(47) Al Gafalla first became recognisable as a village in 1958.

particularly affected by the introduction of irrigation into the area, as it was their land which was appropriated for the purposes of the scheme. Consequently, their traditional way of life was considerably altered, but as will be shown later, significant numbers of nomads from the central Butana were also affected, both because they were encouraged to settle, and also because their traditional migratory routes were interrupted by the scheme and, perforce altered.

3.3 Historical Development Of The Scheme

It was into this background of an essentially subsistence way of life, closely related to its physical environment, that the concept of modernisation, through the construction of a dam and the introduction of irrigation, intruded. The idea of utilising the waters of the River Atbara more effectively had first been mooted as early as 1903 by Sir William Gastin (48), but it only began to be taken seriously in the early 1950s when the Sudan, with independence imminent, was beginning to feel some dissatisfaction at the existing Nile Waters Agreement, signed in 1929 between Egypt and the Anglo-Egyptian Condominium of the Sudan (and slightly modified in 1936), which appeared to give Egypt a disproportionate smount of water compared to the Sudan (49). Thus, with the publication of a report suggesting the feasability of the construction of a dam upstream from Khashm el Girba in 1954 (50), hopes of utilising the Atbara's waters effectively rose, and, following independence in 1956, plans to this effect were in hand:

> ". . . . . the plans for the construction of the dam and the digging of the canals were authorised late in 1958". (51)

(48) Sir W. Gastin "The Nile Basin", London 1903.

(49) C. D. O'Farran "The Nile Waters Question in International Law". In S. N. and R. Vol. 41, 1960 p. 98.

(50) H. Bell op. cit.

(51) Republic of the Sudan (y) W.R.C. "Irrigation and Agriculture", p. 13 (in arabic) n.d.

Such unilateral action would have been completely contrary to the 1929 Agreement, and, although lengthy legal arguments were drawn up (52), these would have been subject to some considerable debate in International Law (53). At the same time, however, Egypt was anxious to go ahead with plans for the construction of the High Dam at Aswan (54), which would equally have contravened the existing Agreement. However, in 1959, any possible dispute between the 2 countries was assuaged when the new ruler of the Sudan, General Abboud (55), concluded negotiations with the Egyptian Government, culminating in the new Nile Waters Agreement of 1959, which enabled the Sudan to increase its offtake from the Nile and its tributaries from 4 milliards (56) per annum to $18\frac{1}{2}$ milliards per annum: at the same time Egypt's share was increased from 29 milliards to $55\frac{1}{2}$ milliards (57), but more importantly it agreed to the construction of the High Dam at Aswan, which involved the flooding of a considerable area of the Sudan as well as part of Egypt, thereby necessitating the resettlement of a large number of Sudanese Nubians from the area. The opportunity of solving the problem of the resettlement of this population with the proposed dam at Khashm el Girba was obvious, and was achieved with a certain inevitability, despite many negotiations between the Government and Nubian representatives (58). In fact the Nubians were originally offered 6 sites, from which,

(52) Republic of the Sudan (j) Ministry of Irrigation and H.E.P. "The Nile Waters Question: The Case for the Sudan, the Case for Egypt and the Sudan's Reply", Khartoum 1955.

(53) C. D. O'Farran op. cit.

(54) Ibid.

(55) General Abboud came to power in May 1958 after a military coup.

(56) A milliard equals 1,000 million cubic metres.

(57) I. H. Abdalla (a) "Historical Studies on the Transfer and Resettlement of the Halfa Population at Khashm el Girba", M.A. Thesis, Khartoum 1967 p. 54.

(58) H. Dafalla "The Nubian Exodus" London 1975 pp 124-139.

they were told, they would be able to choose their new home (59), but, as Abdalla suggests, matters were probably arranged so that the Khashm el Girba site became the one chosen, and in effect the Nubians had no real part to play in the final decision (60). Meanwhile the plans for utilising the waters of the Atbara were beginning to be implemented, and in October 1960 a pilot farm was established 30 kilometres to the north of Khashm el Girba village, with an area of 200 feddans and the object of "carrying out experiments so as to guarantee the utmost benefit from the land" (61). The farm was subsequently elevated to the level of a Research Station and increased to 866 feddans, and the "execution of the plan started in 1961" (62). By 1964 the first Nubians were being resettled on the scheme (63).

Apart from the resettlement of the Nubians, however, 2 other important aspects related to the scheme: a sugar plantation, including a refinery, was incorporated into the First Phase; while the scheme was also intended to integrate and settle a proportion of the indigenous nomadic population (64). Indeed, in 1963 the I.L.O., at the request of the Sudanese Government, had conducted a study and presented a report on the feasability of settling the nomads of the Butana, which outlined favourable prospects (65). A few

(59) I. H. Abdalla (h) "The Choice of Khashm el Girba for the Resettlement of the Halfawis". In S. N. and R. Vol. 51, 1970 p. 68.

(60) Ibid. p. 69.

(61) Republic of the Sudan (b) op. cit.

(62) Republic of the Sudan (y) op. cit. p. 13.

(63) I. H. Abdalla (b) op. cit.

(64) M. Y. Sukhar and M. H. el Jack "Mass Resettlement of the Population of the Lands Flooded by the Aswan High Dam: A Socio-Economic Appraisal of the Resettlement of the People of Wadi Halfa at Khashm el Girba Agricultural Scheme". In 'Papers Presented to the National Conference on Human Environment and Development' held on 5-12 February 1972, Khartoum, pp. 24-5.

(65) I.L.O. op. cit.

nomads were settled during the First Phase of the scheme, but the majority were integrated during Phases II to V, from season 1966/67 onwards (66).

3.4 Administration On The Scheme

Efficient administration is necessary within any system to enable it to operate properly, and it is, therefore felt justified at this stage to describe in some detail the administrative arrangements on the scheme at Khashm el Girba. Originally under the auspices of the Ministry of Agriculture, Food and Natural Resources, the scheme came under the control of the Khashm el Girba Agricultural Production Corporation (A.P.C.) a semi-autonomous body based in New Halfa in 1967 (67). Like its counterpart in the Gezira Scheme - the Gezira Board (68) - the Corporation is primarily concerned, as its name implies, with agricultural production, and more particularly the production of cotton, from which it receives its revenue (69). Other aspects of administration and organisation are under the control of various ministries and departments, which are unconnected with the Corporation: thus, the control of the dam and the supply of irrigation water comes under the auspices of the local department of the Ministry of Irrigation and H.E.P. (as does the supply of electricity to New Halfa and the sugar factory); domestic water supply is, however, the responsibility of the Ministry of Works. General administrative duties concerned with the collection of taxes, and the maintainance of law and order comes under the auspices of the Ministry of Local Government, Housing and Community Development, through its local headquarters in New Halfa at the majlis (Council). This body is also responsible for the provision of housing and education facilities,

(66) Personal communication: A.P.C. New Halfa.

(67) Personal communication: A.P.C. New Halfa.

(68) Sudan Gezira Board (a) "The Gezira Scheme" Wad Medani 1971.

(69) Personal communication: A.P.C. New Halfa.

although the Health Department looks after the provision of health services. In regard to social services, the administration at Khashm el Girba differs fundamentally from that operating on the Gezira, for the provision and maintenance of such services there is the responsibility of one department of the Gezira Board, namely the Social Development Department, which has been in existence since 1950 (70).

As illustrated above, each ministry or department appears responsible for a fairly distinct aspect of the administration and organisation of the scheme, and it is now proposed to examine in detail the functions of these various bodies.

a) Agricultural Production Corporation This body is responsible for the provision of services necessary to the production of crops on the scheme, with the exception of the supply of irrigation water (71). Thus, it provides the tenants with the necessary seed (for cotton, wheat, and groundnuts), and fertilisers, and is also responsible for the spraying of insecticides (72). Because of the importance of cotton to the economy of the Sudan as a whole, the Corporation is particularly concerned with this crop's production, and after it has been harvested, is responsible for its processing, transport and sale. Subsequently, it calculates the income of each tenant according to his own personal account, which is made up of 2 components: a joint account with the Corporation, and an individual account (73). Accordingly, each tenant receives a certain amount of money per kantar of cotton produced in a year (74) (Table 3.2), but such an income may vary each year depending

(70) Sudan Gezira Board (a) op. cit. pp. 29-35.

(71) Personal communication: A.P.C. New Halfa.

(72) Personal communication: A.P.C. New Halfa.

(73) For an outline of what is involved in both the individual and the joint accounts see Appendix C.

(74) One kantar is equal to 100 pounds of cotton fibre, or 315 pounds of cotton seed.

Table 3.2. Price received by tenants per large kantar of cotton produced in selected years.

year	price received(LS)
1965/66	2.194
1968/69	2.156
1969/70	1.952
1970/71	2.148
1972/73	2.642

Source: A.P.C. New Halfa.

on a variety of factors: the world price of cotton at the particular time of sale; the expenditure incurred during the season under the joint account; and the debts incurred by the individual tenants under their individual accounts. These factors will be examined in greater detail later (75). Such an operation is not, however, followed with respect to wheat and groundnuts, the disposal of which is left to the discretion of the tenants. But the Corporation does give advice on improved agricultural techniques for these crops in addition to cotton, and generally supervises cultivation throughout the scheme by means of extension and field officers, who are situated at strategic locations throughout the scheme (76).

b) Ministry Of Irrigation And H.E.P. This department is responsible for the supply of water at 2 levels: the overall regulation of water flow from the dam into the main canal, which includes water from both irrigation and domestic purposes; and the regulation of water supply to the blocks within the scheme for the irrigation of crops. For the purposes of administration at the local level the scheme is divided into various blocks of which there are 5 in all, 2 covering the Nubian area, and 3 covering the area where the nomads have settled. Thus, the second of the 2 functions is achieved through liaison with the agricultural inspectors responsible for the various blocks, who collect the water requirements of the tenants on their blocks, and report the block totals to the engineer in charge, who relays this information to the dam engineer. The required daily amount is then released into the main canal and distributed to the blocks through a hierarchical system of lesser canals (77). The upkeep of the canals is also, in the main, the responsiblity of the Irrigation Department, with the

(75) See Chapter Five.

(76) Personal communication: A.P.C. New Halfa.

(77) Personal communication: Irrigation Department, New Halfa.

exception of the most minor canals (the Abu XX and the Abu VI), which are the responsibility of the tenants to maintain (78). Unlike on the Gezira, where watering takes place only during daylight hours (79), watering at Khashm el Girba is on a 24 hour basis. This is because:

> ". . . . . the gradient of the land surface and the silt content of the irrigation water are both much greater in Khashm el Girba (than in the Gezira)". (80)

The peak water demand on the dam occurs during October and November, while the low period occurs between February and June. The water requirements for the last 2 seasons on the scheme are shown in Table 3.3.

c) Ministry Of Local Government The function of this body is the general day-to-day administration of the scheme and its immediately surrounding area, through the collection of taxes, the issuance of permits (81), and through its connected departments, the Police Department and the Law Courts, the maintainance of law and order. In addition, its responsibilities during the early years of the scheme also included the provision of housing for the Nubians and the settlement of the nomads, while it is still responsible for the provision of education facilities, and the supply of technical assistance when required by the village committees embarking on self-help projects (82).

d) Health Department The responsibilities of the Health Department include the treatment and prevention of disease, particularly malaria and bilharzia, and the maintainance of general cleanliness in New Halfa and

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(78) Personal communication: Irrigation Department, New Halfa.

(79) Focus by the American Geographical Society Vol. XVII, No. 1, September 1966 "The Sudan" by J. R. Randell p. 5.

(80) Ibid. p. 5.

(81) Permits are required for the purchase of sugar, oil and petrol.

(82) All information in this section has come from the Council Offices in New Halfa.

Table 3.3. Allotment of water resources from the dam at Khashm el Girba. 1972/73 - 1973/74.

	1972/73	1973/74
total agricultural requirements	1,208	885
requirements of sugar plantation	305	255
domestic water requirements	95	95
overall water requirements	1,608	1,235

All figures are in million cubic metres of water.

Source: Ministry of Irrigation. New Halfa.

the villages of the scheme. This is achieved through the provision of health centres, dispensaries and dressing stations throughout the scheme, in each of which is situated a health officer (83), as well as the presence of hospitals in New Halfa, Khashm el Girba, and a rural hospital near to the sugar factory (84).

The main point to emerge from the preceding discussion of the administrative arrangements within the scheme, is the multiplicity of units involved therein. While it is not intended at this stage to say whether such a situation is beneficial or otherwise, there is always a possibility that lack of communication between bodies may arise because of this multiplicity, but it remains to add that the situation in New Halfa is far from unique in the Sudan, and can be said to be the rule rather than the exception.

3.5 Tenancy Arrangements

3.5.1 Land Ownership In The Sudan

Of fundamental importance to the practice of agriculture in any country is the system of land tenure under which it operates, and in this respect the Sudan is probably unique amongst the countries of the Middle East, for the system at present in existence in the country very closely resembles that which was in operation prior to the rule of the Funj Sultanates, and later the Turko-Egyptian occupation (85). During these 2 periods, and through the period of Mahdist rule which followed, changes were made to the original system, but, with the arrival of the Anglo-Egyptian Condominium, and *de facto* British rule of the country, the changes which threatened to

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(83) For an examination of the provision of health facilities on the scheme see Chapter Seven.

(84) Personal communication: Health Department, New Halfa.

(85) M. H. Awad "The Evolution of Landownership in the Sudan". In M. E. Journ. Vol. 25, No. 2, Spring 1971 p. 226.

create a biased and unequal land ownership system were reversed, and the measures implemented by the Condominium government:

> ". . . . . successfully stemmed the growth of an indigenous neo-feudalist class, prevented the dissolution of communal holdings and the appropriation of the land by tribal chiefs, checked the expropriation of the small freeholders by wealthy landowners, and arrested the alienation of land to Europeans". (86)

Indeed, so successful were the measures taken that by 1910:

> ". . . . . the Condominium government was in full control of the country and its title to all lands other than those held in fee simple was undisputed". (87)

Since that time the pattern of land ownership in the Sudan has changed very little, in marked contrast to other Middle Eastern countries such as Egypt, Iraq and Syria, where the seizure of power by military force was rapidly followed by attempts at large-scale land reform (88). Consequently, there are now 2 basic types of landownership in the Sudan: viz, freehold land which amounts to some 6,000,000 feddans and which is:

> ". . . . . practically confined to Northern, Khartoum, and Blue Nile Provinces, where most of the narrow band of alluvial soil (sagia land or ilwi (89) and much, but by no means all the seluka (90) is registered. In addition practically all the rainlands of the Gezira, and some further north have been settled", (91)

and that owned by the government, consisting of some 590.6 million feddans (92).

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(86) Ibid. p. 212.

(87) Ibid. p. 226.

(88) M. H. Awad op. cit. p. 212.

(89) Sagia is the land above the flood line of the river.

(90) Seluka is the land below the flood line of the river, cultivated as the water retreats with a seluka stick.

(91) A. B. Miskin "Land Registration". In S. N. and R. Vol. 31, 1950 p. 281.

(92) M. H. Awad op. cit. pp. 217-8.

This second category can be divided into 3 types:

"a) Government land subject to no rights

b) Government land subject to rights vested in a community such as a tribe or village", (93)

and

"c) Government land subject to rights vested in an individual". (94)

Although strictly speaking government controlled agricultural schemes are based upon the first of these 3 types of land holding, as Bolton has noted for the schemes at Gash and Tokar (95), in practice, due to tenurial arrangements usually adopted, they more closely conform to the third type, for in practice, in practically all schemes, the land is given to the farmer on a tenancy basis, and such tenure is secure, provided that the tenant does not completely ignore his responsibilities. Prior to the introduction of a scheme, the land may have been held in individual ownership, as was the case with parts of the Gezira (96), or held by the government with the rights vested in a community, as was the situation on the Gash and Tokar schemes, and also of the proposed Rahad scheme.

3.5.2 Tenancy Arrangements At Khashm El Girba

The tenancy arrangements at Khashm el Girba follow very much the pattern of the second arrangement outlined in the previous section, namely that the land was formerly regarded as the grazing grounds of the Shukriya and other tribes (97). The seizure of this land by the government for the purposes of

(93) A. R. C. Bolton "Land Tenure in Agricultural Land in the Sudan". In J. D. Tothill (ed) op. cit. p. 188.

(94) Bolton (op. cit.) includes individually held land under category (b).

(95) Bolton op. cit. p. 188.

(96) K. S. al Ami "Land Tenure System in the Gezira". In Iraqi Geog. Journ. Vol. 1, 1967 p. 15.

(97) Other tribes include the Rashaida, the Lahawin, the Ahamda, the Beni Amer and the Hadendowa.

an irrigation scheme whose primary purpose was the resettlement of an alien population, viz, the Nubians, created some antagonism in the early years of the scheme's development, not only towards the government but also towards the incoming population (98), but reports suggest that the situation has improved as the scheme has grown older, and more local inhabitants have taken tenancies upon it (99).

Tenancies on the scheme are held, as on other schemes in the Sudan (100), on an annually renewable basis, and they constitute an area of 15 feddans: although tenure is reasonably secure from one year to the next, a tenant may be forced to leave the scheme if the maintainance of his tenancy is deemed inadequate. But before such drastic action is taken, a tenant is usually given 3 warnings as to his conduct, and may also be fined (101). The number of cases recorded where a tenant was relieved of his tenancy amounted to approximately 200 in the season 1973/74, which constitutes less than one per cent of the total number of tenants on the scheme (102). In the initial phases of the scheme tenancies were allocated to those former nomads whose traditional grazing land had been removed under the expansion of the scheme, but since that time (1967) there has been no priorisation of who should and who should not be allocated a tenancy, as they were offered to any nomad from the surrounding areas who wished to take up agriculture on the scheme. In addition, a tenant settling on the scheme had no costs to pay for his tenancy (103).

(98) M. S. Osman and H. E. El Hag "Irrigation Practices and Development in the Sudan", Khartoum 1972 p. 15.

(99) Personal communication: Council offices, New Halfa.

(100) Personal communication: Ministry of Agriculture, Khartoum.

(101) Personal communication: A.P.C. New Halfa.

(102) Personal communication: A.P.C. New Halfa.

(103) Personal communication: A.P.C. New Halfa.

As the scheme is a scheduled production scheme, the tenant is not allowed to grow the crops he wishes, but must operate a rotation of cotton, wheat and groundnuts, each crop occupying 5 feddans of his tenancy, but in practice strict adherence to the rotation is not always followed, and this is particularly true in relation to the groundnut crop:

> "The unpopularity of groundnuts is increasing. Area under groundnuts shrank to 4,455 in 1967/68 season". (104)

In addition to the 15 feddan tenancies, however, the Nubians were allotted a certain amount of extra land ('milk land'), according to the amount of freehold land they had held at Wadi Halfa: unlike the tenancies this land is freehold, and therefore owned by the Nubians, so that they are allowed to use the land as they wish, although the cultivation of fruit and vegetables is actively encouraged (105). No similar arrangement exists for the local tenants, although a suggestion that half a feddan of their tenancies be given over to personal use, is at the moment under consideration (106). In addition to this land, however, is what is known as shawabir land, which is land that could not be incorporated into either freehold or leasehold land, extending over some 18,000 feddans. This is rented individually to tenants or entrepreneurs who mainly cultivate wheat on the land (107).

Such a system of land tenure may restrict the tenants' interest in their land, as it is not their own, and Sorbo has demonstrated for the Nubian population at Khashm el Girba that they naturally take more care of

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(104) Khashm el Girba A.P.C. (a) op. cit.

(105) Personal communication: A.P.C. Khartoum.

(106) Personal communication: A.P.C. Khartoum.

(107) H. G. Blanckenburg "The Khashm el Girba Settlement Scheme in Sudan: An Appraisal for the World Food Programme", Institut fur Auslandische Landwirtschaft der Technischen Universitat, Berlin 1969 p. 13.

their 'milk land' than of their tenancies (108), but as Awad points out, tenants leasing from the government do have reasonable security of tenure, and are, therefore, more inclined to invest in the land. He concludes that the existing institutions governing landholding in the Sudan are:

> ". . . . . quite workable and far more intelligible and acceptable to the indigenous population than most of the institutions proposed to replace them". (109)

3.6 Agricultural Production

3.6.1 The Rotation

Since the time of the Anglo-Egyptian Condominium, cotton has not only been the country's chief agricultural product, but it has also been its chief export and the mainstay of the economy (110). Consequently, in any scheme initiated, cotton is almost automatically included within the rotation, with the result that, apart from the Gash Delta scheme (111), and a few smaller pump schemes in Northern Province, most of the country's agricultural schemes include, to a greater or lesser extent, cotton in their rotations. Not only is it included, but it usually takes precedence over all other crops in the rotation. Such a situation is true of the scheme at Khashm el Girba, where the A.P.C. is concerned with the production of cotton in all its aspects, whereas the cultivation of wheat and groundnuts is left largely to the tenants. Though cotton is pre-eminent amongst the 3 crops, as far as the A.P.C. is concerned, the introduction of groundnuts and wheat into the rotation serves the policy:

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(108) G. Sorbo (b) "Economic Adaptations in Khashm el Girba", African Studies Seminar Series, No. 14, Sudan Research Unit, Faculty of Arts, University of Khartoum, 1972 p. 17.

(109) M. H. Awad op. cit. p. 228.

(110) See Appendix L.

(111) A. R. Hassan Ahmed "Castor in the Economy of the Gash Delta", Gash Delta Agricultural Corporation, Khartoum 1969.

> ". . . . . to increase production volume and introduce new types of agricultural products in conformity with domestic requirements". (112)

Production on the scheme is organised according to a scheduled programme of sowing and harvesting for each crop in the rotation, although, as will be seen later (113), strict adherence to the timetable is not always followed by the tenants. Groundnuts are the first crop to be sown, scheduled for July, with harvesting to take place in late October or early November, while in August the cotton crop is due for sowing. This is harvested usually in February or March. Wheat is scheduled for planting in October and for harvesting in March or April. During the early years of the scheme several experiments were conducted to ascertain optimum dates for the sowing of the crops, as for example in the case of cotton:

> ". . . . . it is important to think of optimum sowing, at this stage as a period rather than a fixed date . . . . . The period of sowing date which could be suggested is from 1st August to mid-September, but not later than mid-September". (114)

This extract illustrates amply that the dates given above are reasonably flexible.

In the threefold rotation each crop serves a specific purpose: cotton is the main cash crop, while groundnuts are a good second cash crop, but more importantly serve as the legume break in the rotation. Wheat acts as a staple food crop and was largely introduced because it was the staple food

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(112) Democratic Republic of the Sudan (c) Ministry of Planning "The 5 Year Plan of Economic and Social Development of the Democratic Republic of the Sudan for the Period 1970/71-1974/75", Vol. 1 'Major Trends of Development', Khartoum 1970 p. 14.

(113) See Chapter Five.

(114) Khashm el Girba A.P.C. (b) "Sowing at Optimum Date in Relation to Preplanting Operation and Irrigation", n.d.

crop of the Nubians prior to their resettlement (115). This rotation has, however, been criticised as not being:

> ". . . . . the best combination either in terms of annual gross returns per feddan or on gross returns per cubic metre of water". (116)

3.6.2 Crop Production

Since the beginning of the scheme the natural trend in production and area has been towards a steady increase, as more and more land has become irrigated, and it is only in the last few years that there has been a levelling off of this trend. The accompanying table (Table 3.4) demonstrates this trend, but at the same time highlights certain anomalies which deserve some explanation. The most obvious point is the extremely low figure for the area under groundnuts, which, even though it has dramatically increased in recent years, is still well below the figures for cotton and wheat. This has been attributed to:

"1. Difficulty and high cost of digging

2. Difficulty of hand-threshing

3. Low price". (117)

With the elimination of the last of these problems in the season 1969/70 the dramatic increase in area planted occurred, but the continued presence of the other factors still keeps the figure for area cultivated relatively low.

Cotton and wheat have shown a steady increase in area cultivated, until their levelling off in recent years, but the cotton crop has tended to lag behind slightly. This has been attributed to better returns for wheat, its ease of cultivation and also because it is a crop to which the immigrant

(115) D. S. Thornton and R. F. Wynn "An Economic Assessment of Sudan's Khashm el Girba Scheme". In E. A. Journ. of Rural Devt., Vol. 1 No. 2, July 1968 p. 12.

(116) G. D. Sid Ahmed (b) op. cit. p. 161.

(117) Khashm el Girba A.P.C. (a) op. cit. p. 7.

Table 3.4. Area, production and yield of the crops in the rotation at Khashm el Girba.

year	cotton area	cotton prod'n	cotton yield	wheat area	wheat prod'n	wheat yield	groundnuts area	groundnuts prod'n	groundnuts yield
1964/65	15365	53777	3.5	32500	14625	0.45	700	450	0.64
1965/66	32965	82412	2.5	35500	14200	0.40	2000	600	0.30
1966/67	53375	192150	3.6	53875	44156	0.75	5700	4270	0.75
1967/68	70755	346699	4.9	83779	32672	0.39	4455	4296	0.96
1968/69	91605	428711	4.7	105061	50429	0.48	2315	1065	0.46
1969/70	102475	491880	4.8	125131	42046	0.34	34549	11746	0.34
1970/71	107385	485380	4.5	111280	66768	0.60	26450	11150	0.42
1971/72	108025	449903	4.1	117598	49505	0.42	12905	6881	0.53
1972/73	109220	231285	2.1	62600	37560	0.60	40000	28000	0.70
1973/74	109535	424590	3.9	120650	72390	0.60	45375	22637	0.50
1974/75	109185	n.a.	n.a.	n.a.	n.a.	n.a.	65910	n.a.	n.a.

n.a. - figures not available.

Figures for area are in feddans.

Figures for cotton production and yield are in large kantars and large kantars per feddan respectively.

Figures for wheat and groundnuts production and yield are in tons and tons per feddan respectively.

Source: A.P.C. New Halfa.

Nubians were used (118). The one exception to this occurred during season 1972/73, when the area under wheat slumped to only 62,600 feddans. This was caused by a shortage of water due to poor rains - cotton is given priority of water supply (119), and groundnuts are sown early, thereby enjoying the benefit of some rain, so that wheat is the crop to suffer most from any shortage of water.

Of particular importance in production are crop yields, which for all 3 crops show remarkable variations, in the case of groundnuts varying from as high as 0.96 tons per feddan in 1967/68 to as low as 0.30 tons per feddan in 1965/66. Such variations may be due to such factors as good or poor rainfall, prevalence or scarcity of disease and pests, etc. At this point it is worth comparing the yields achieved at Khashm el Girba with those achieved elsewhere in the Sudan. Table 3.5 shows that yields at Khashm el Girba are less than for the Gezira and the Agricultural Reform Corporation schemes, where long staple cotton is cultivated, but generally higher than on the schemes where American cotton is cultivated (120).

3.7 Conclusion

This, therefore, is the context into which the nomads found themselves thrown, when they settled on Khashm el Girba. It is now proposed in the following chapters to examine the geographic, economic and social aspects of their settlement in relation to this background.

(118) See pages 96-97.

(119) Personal communication: A.P.C. New Halfa.

(120) Democratic Republic of the Sudan (b) Bank of Sudan, Fifteenth Annual Report for the Year Ending 31st December 1974, Khartoum 1975 p. 101.

Table 3.5. Average cotton yields on schemes in the Sudan for the year 1973/74.

type/area	yield
long staple	
Gezira	5.0
Agricultural Reform Corporation	4.1
total	4.8
American types	
Zeidab and Guneid	4.9
Abu Hamil, Gash and Tokar	1.6
Khashm el Girba	3.9
Nuba Mountains	0.5
Es Suki	4.2
Gedaref and Upper Nile	1.2
Habila area	0.7
total	2.3
grand total	4.0

Figures are in large kantars per feddan.

Source: Democratic Republic of the Sudan(b). Bank of Sudan. 15th annual report for the year ending 31st December 1974. Khartoum. 1975.

CHAPTER FOUR

THE SETTLEMENT OF NOMADS AT KHASHM EL GIRBA

4.1 Introduction

As was outlined in Chapter Two, the settlement of nomads has been and still is generally regarded as "a structural necessity for the governments of the underdeveloped countries" (1), and, since achieving its independence, the Sudan, through its various governments, has attempted to implement such a procedure: in the main, by schemes directed at agricultural development in general. The agricultural scheme at Khashm el Girba represents just such an attempt, and, indeed, was the first large-scale project of its kind initiated by an independent Sudanese government. In the present chapter, particular emphasis is to be laid on the physical aspects of the settlement on the scheme.

The main hypothesis of this chapter concerns the degree to which physical settlement on the scheme has been achieved, and may be more formally stated thus:

> That the agricultural scheme at Khashm el Girba has effected the physical settlement of peoples of nomadic or semi-nomadic origin from the areas in its vicinity.

To examine this contention, it will first of all be necessary to establish the origins of the settlers on the scheme, both in spatial terms, and in relation to their former mode of existence. Secondly, it is intended to

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(1) E. H. Jacoby "Man and Land: The Fundamental Issue in Development", London 1971 p. 286.

analyse the numbers which have actually been settled on the scheme, both in terms of the rate of settlement, and also the extent to which the actual numbers settled compare with the projected number of settlers on the scheme. Finally, the nature of the settlement which has taken place will be examined.

4.2 Origins Of The Settlers

The scheme at Khashm el Girba was originally implemented to resettle the displaced Nubians from the Wadi Halfa region of northern Sudan (2), but at the same time, plans were being made so that the local tribes of the Butana might also be settled on the scheme. Indeed, the Sudanese Government, in 1963, requested help from the International Labour Office (I.L.O.), who sent a Mission to the Sudan, with the following objective:

> ". . . . . to assist the Government of the Sudan in drawing up a plan concerning the sedentarisation of the tribes in the Khashm el Girba area (North Sudan)". (3)

Thus, from the start, the scheme was intended to settle nomadic and semi-nomadic peoples of the area, and it is, therefore, necessary to establish that the people now settled on the scheme - with the exception of the Nubians - are indeed of nomadic or semi-nomadic origin. To examine this contention, reference was made to 2 sources of information: first, the data collected during the questionnaire survey conducted by the author, relating to place of origin and former occupation; and second, data relating to the situation in the area around the scheme prior to its implementation, presented in the First Population Census of the Sudan 1955/56 (4).

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(2) See pages 82-83.

(3) I.L.O. Report to the Government of the Sudan on the Sedentarisation of Nomads in the Butana Region of Northern Sudan , Study Planning Mission November 1963 - February 1964, ILO/TAP/Sudan/R8, Expanded Programme of Technical Assistance (EPTA), Geneva 1965 p. 2.

(4) Republic of the Sudan (1) First Population Census of the Sudan 1955/56, including 9 Interim Reports and 2 Final Reports.

Findings for place of origin and former occupation, taken from the questionnaire survey, are summarised in Tables 4.1 and 4.2 respectively. Apart from a few isolated cases, the places of origin of the settlers in the scheme villages surveyed, are situated in 2 main areas, viz, the central Butana, around such centres as Sobagh, Sufeiya, Reira, Geili and Abu Deleiq; and on the edge of the Butana by the River Atbara, around such centres as Sideira and Al Gafalla (Figure 4.1). These areas have frequently been described as the homes of nomadic groups. For example, the Butana has been called "an important grazing area for the livestock of the nomadic tribes" (5), while Harrison has noted the congregation of the population during the rains, and their dispersal during the dry season (6), so that, on the whole:

> ". . . . . good grass growth and freedom from flies in the summer make it well suited to animal rearing". (7)

Pastoral nomadism would appear, therefore, from these descriptions, to have been the main occupation of the population: however, the results presented in Table 4.2 appear to contest this assertion, in that the majority of the population interviewed gave farming as their former occupation, as opposed to shepherding. This phenomenon requires some explanation, and for this explanation, it is necessary to refer to the Population Census, which, being conducted in 1955 and 1956, reflects the situation in the area prior to the existence of the scheme.

For the purposes of presenting information collected in the Census, the country was divided into Census areas. The area from which the majority of the settlers at Khashm el Girba originated, namely the central Butana, and the west bank of the River Atbara, between the villages of Goz Regeb in

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(5) Sir A. Gibb and Partners "Kassala Province Survey" London 1968 p. 6.

(6) M. N. Harrison "Report on the Grazing Survey of the Sudan" Khartoum 1955, mimeographed, irregular pagination.

(7) K. M. Barbour "The Republic of the Sudan: A Regional Geography" London 1961 p. 215.

Table 4.1. Place of origin of settlers in selected villages on the scheme.

source area	Wad Nabar	Umrahau	New Geili	New Reira	New Baraysi	Arrida Shukriya
riverain fringe	96.15	70.59	-	4.17	9.52	8.00
Umrahau	-	70.59	-	-	-	4.00
Wad Nabar	88.46	-	-	4.17	-	-
others	7.69	-	-	-	9.52	4.00
Central Butana	-	26.47	100.00	91.67	80.95	80.00
Abu Duleiq	-	-	40.00	-	-	-
Sobagh	-	23.53	-	54.17	-	24.00
Sufeiya	-	2.94	60.00	37.50	-	-
Baraysi	-	-	-	-	80.95	8.00
Reira	-	-	-	-	-	48.00
Others	3.85	2.94	-	4.17	9.52	12.00
Total	100.00	100.00	100.00	100.01	99.99	100.00

All figures are percentages.

Source: Author's questionnaire survey.

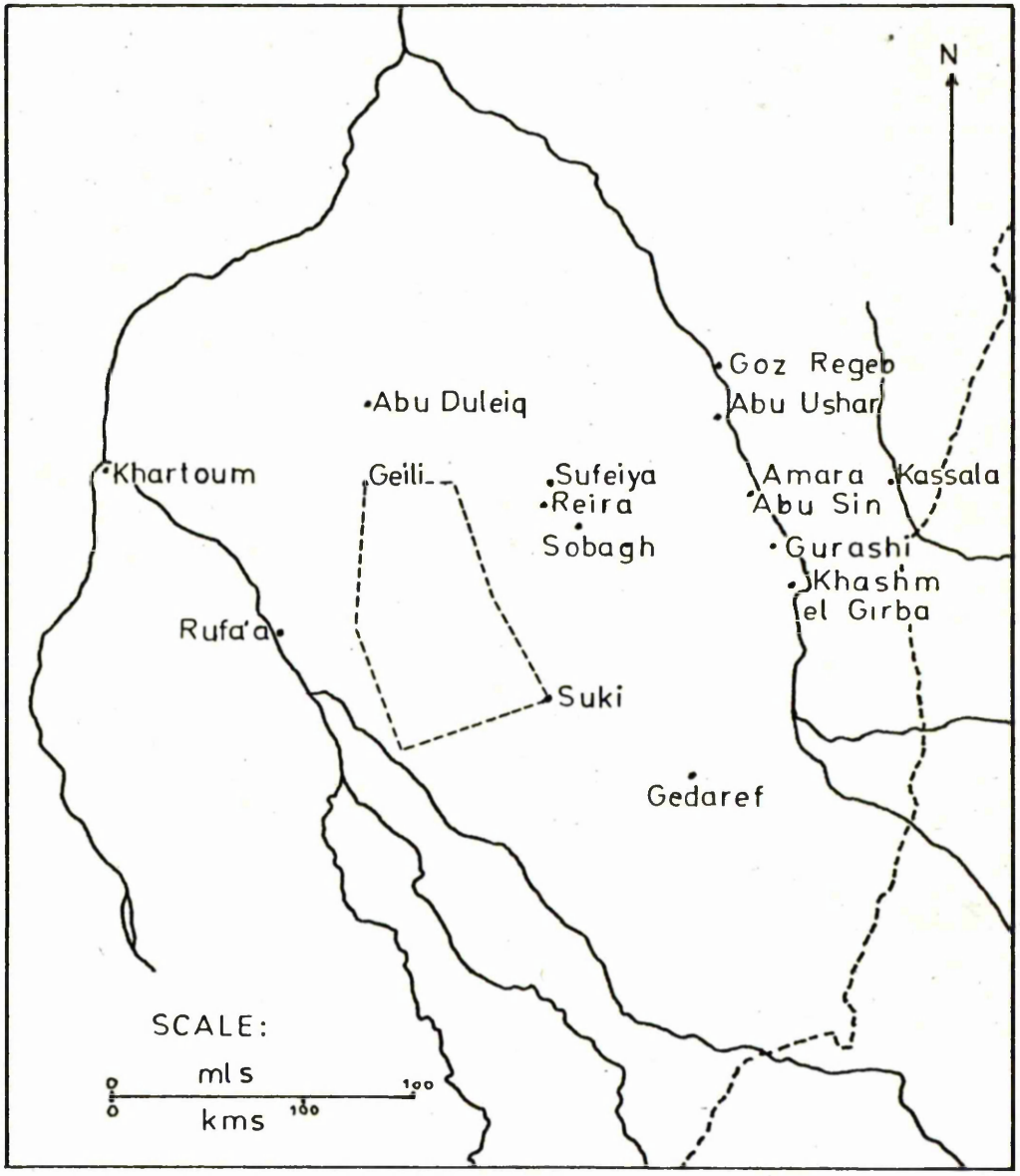
Table 4.2. Former occupation of settlers in selected villages on the scheme.

former occupation	Wad Nabar	Umrahau	New Geili	New Reira	New Baraysi	Arrida Shukriya	total
farmer	64.67	70.59	66.67	71.67	57.75	62.17	67.25
shepherd	25.00	23.52	26.67	20.00	32.25	31.09	24.33
other	10.33	5.88	6.67	8.34	10.00	6.74	8.41
total	100.00	99.99	100.01	100.01	100.00	100.00	99.99

All figures are percentages.

Source: Author's questionnaire survey.

Figure 4.1. The location of traditional tribal centres on the Butana Plain.



the north, and Khashm el Girba, itself, in the south, is situated within one Census area, that of Gedaref North, Census Area Number 521. Actual enumeration in the Census, however, took place at a lower level, the administrative unit adopted being the omodia (8). At this level each omodia was classified as either 'nomadic' or 'compound', by which means the nomadic population of the country was estimated. In the case of Gedaref North, 19 of the omodias were classified as nomadic, accounting for some 79,774 persons, compared with 10 compound omodias containing 93,956 persons (9). The majority of the population of the Census area was, therefore, settled, but the Census area itself extended over a larger area than that covered by the central Butana and the River Atbara areas, stretching southwards towards the Ethiopian border and westwards towards the Blue Nile (Figure 4.2). In this context, the location of the omodias becomes important: each omodia falls within one of the tribal divisions of the Butana, of which 7 are represented in Gedaref North, namely: Abu Sin, Abu, Duleiq, Atbara, Butana, Kenana, Lahawin and Western (10). Comparing the classification of omodias - whether they are nomadic or compound - with the tribal division (khut) in which each omodia is situated (Table 4.3), a distinct division emerges between those khuts which are nomadic and those which are compound. Thus, the Abu Sin and Western khuts contain exclusively compound omodias, whereas, for the other 5 khuts, the reverse is true. The

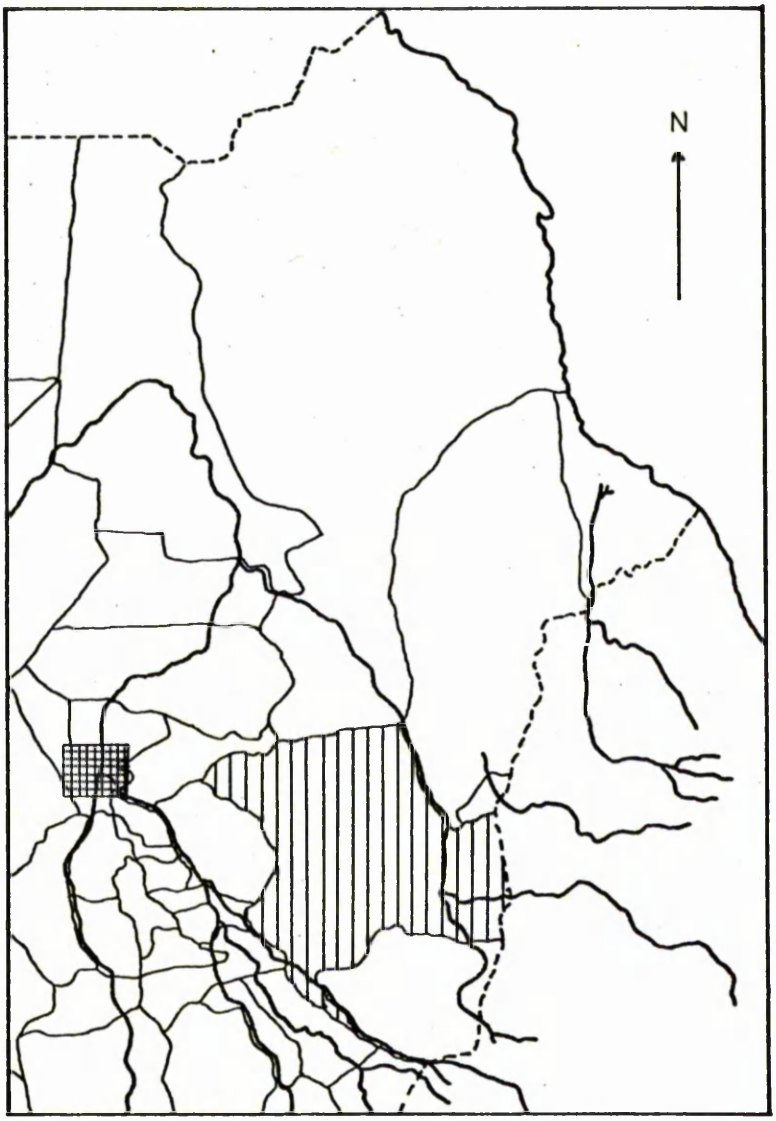
(8) According to the First Population Census of Sudan 1955/56, Notes on omodia map, Khartoum 1958:

"The omodia is essentially a concept derived from the Arab tribal organisation, whereby each tribe is ruled by a Nazir, beneath whom there is a number of Omdas, each responsible for an Omodia, and beneath the Omda is the Sheikh, who is the headman of a small group of families, if the people are nomads, or often a village if the people are settled". (p. 7)

(9) First Population Census of Sudan 1955/56, Seventh Interim Report, Khartoum 1957.

(10) First Population Census of Sudan 1955/56, Ninth and Final Interim Report, Khartoum 1958.

Figure 4.2. Location of Gedaref North Census Area within eastern Sudan.



Source: Republic of the Sudan.(v). Ministry for Social Affairs. Population Census Office. First population Census of Sudan. 1955/56. Final (9th) Interim Report. Khartoum. 1958.

Table 4.3. Classification, khut and population of the omodia divisions of Gedaref North Census Area.

omodia	class	population	khut
Hasaballa Yousif	nomadic	7,174	Lahawin
Mohd. Mahmoud Toweiber	nomadic	2,789	Lahawin
Ahmed Ali Salih	nomadic	1,122	Lahawin
Hamed Madkour	nomadic	1,826	Kenana
Hamed Yousif	nomadic	7,270	Butana
Ahmed Ali Omara	nomadic	10,090	Atbara
Mohd. el Hassan Abu Sin	nomadic	8,523	Atbara
Badawi Mohd. Nasr el Din	nomadic	1,024	Abu Duleiq
Ahmed Mohd. el Aser	nomadic	4,704	Lahawin
Guma'a Idris	nomadic	2,270	Lahawin
Abdalla Ali Ahmed	nomadic	4,236	Lahawin
Ibrahim Ahmed Mohd.	nomadic	4,160	Lahawin
Nasr el Din Abdalla Galis	nomadic	1,897	Kenana
Awad el Karim Mohd. Ahmed	nomadic	1,589	Kenana
Ahmed Hamid Aghraki	nomadic	758	Kenana
Mohd. Ahmed el Hardallo	nomadic	6,147	Butana
Abd el Gadir Ahmed el Tayeb	nomadic	2,836	Atbara
Ali Abd el Gadir Tai	nomadic	9,589	Abu Duleiq
Hassan Mohd. Hasab Rabba	nomadic	1,502	Abu Duleiq
special category	nomadic	238	-
nomadic omodias:	total	79,774	

/cont.,

Table 4.3. Classification, khut and population of the omodia divisions of Gedaref North Census Area.(cont.)

omodia	class	population	khut
Mohd. el Hussein el Tireifi	compound	7,888	Western
El Tayeb Ahmed Baggari	compound	25,582	Western
Abu Agla Abdalla Abu Senn	compound	12,016	Abu Sin
Ahmed Mohd. Ali Zayed	compound	8,565	Abu Sin
Mohd. Ahmed Galli	compound	6,040	Abu Sin
Ali Mohd. el Hud	compound	8,609	Abu Sin
Ali Awad Uqeil	compound	8,653	Abu Sin
Ahmed Mohd. Ahmed Abu Senn	compound	8,683	Abu Sin
Mohd. Sharaf	compound	2,492	Abu Sin
Awad el Karim Hamad el Had	compound	4,024	Abu Sin
special category	compound	1,044	-
compound omodias:	total	93,596	

Source: Republic of the Sudan(t). Ministry for Social Affairs. Population Census Office. First Population Census of Sudan. 1955/56. Seventh Interim Report. Khartoum. 1957.

location of these khuts then becomes crucial to establishing the location of the nomadic proportion of the population of Gedaref North Census Area. The Western khut is situated, as its name implies, in the western part of the Shukriya domain, and is also present within the Census Area bordering Gedaref North to the west - Rufa'a - which lies along the eastern bank of the Blue Nile, while the "Abu Sin section . . . . . live within and in the neighbourhood of Gedaref" (11). Of the other 5 sections the:

> ". . . . . Lahawin . . . . . now cultivate west of the Atbara and close to the Kassala-Khartoum road, and at Maqatta, their tribal centre", (12)

while the Atbara khut occupies the land to the north of the Lahawin, and to the west of the river. The Butana and Abu Deleiq sections are to be found in the central part of the plain (Figure 4.3). These areas largely coincide with the previously established main source areas for settlers on the scheme. It can, therefore, safely be inferred that this population was formerly of a nomadic nature. This assertion is further supported by the report prepared by the I.L.O. on the settlement of nomads in the Butana, which stated that:

> ". . . . . Sheikh Mohamed Hamad Abu Sin told the expert that the Shukria consisted of 7 tribal sections. Five of them are in various stages of nomadism: these are the Butana section, the Lahawiyin, the Atbara, Abu Duleiq and Kenanah sections". (13)

This discussion, however, does not help to explain why farming was given as the primary occupation of most of the inhabitants before their arrival on the scheme, and indeed, examination of the Census results relating to occupation in the area reveals a similar trend to that observed in the questionnaire survey. Within the Census area of Gedaref North, the total number of gainfully employed males amounted to 60,862, which represents

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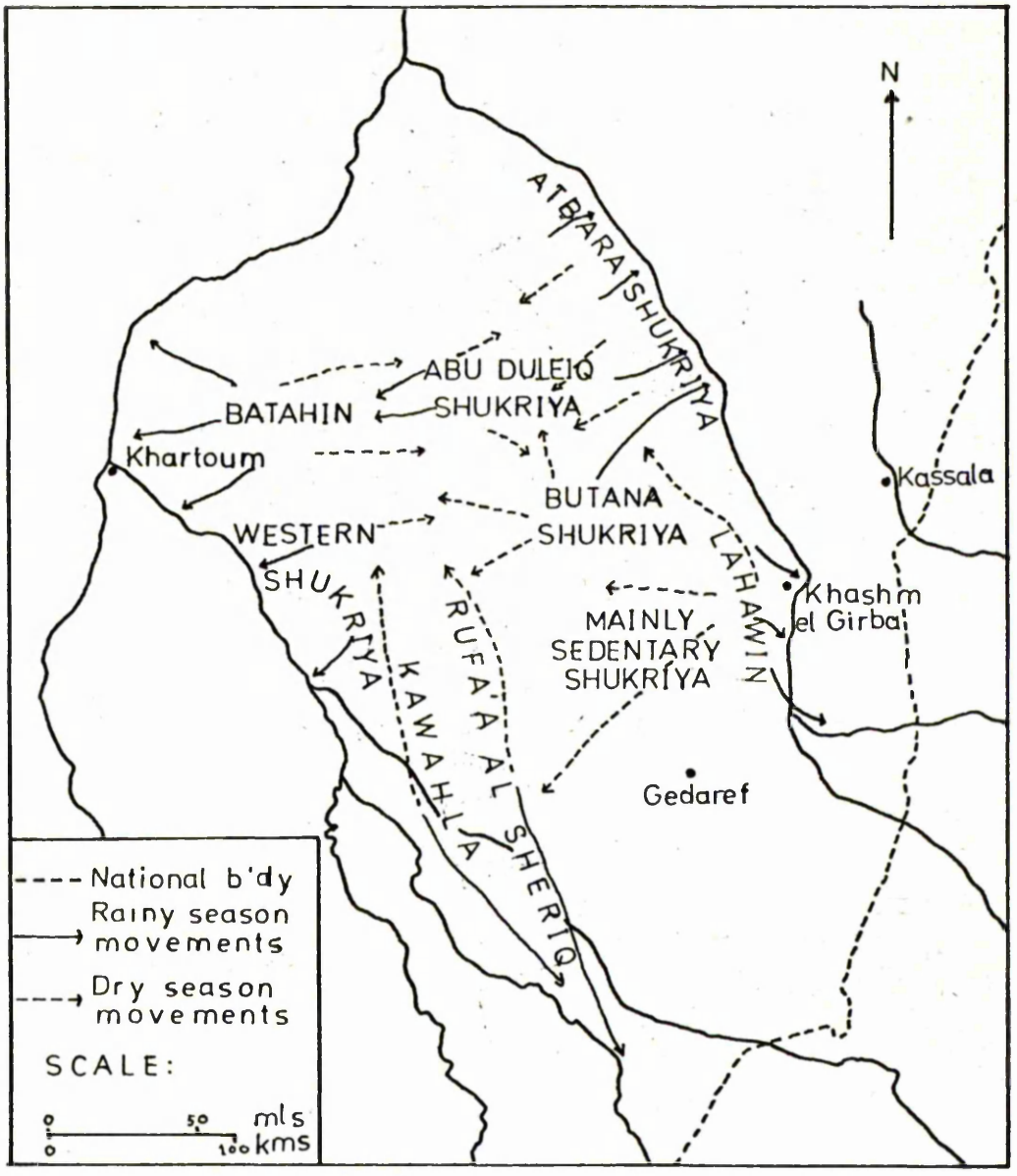
(11) I.L.O. op. cit. p. 7.

(12) J. H. G. Lebon "Land Use in Sudan" World Land Use Survey Monograph No. 4, Bude 1965 p. 116.

(13) I.L.O. op. cit. p. 7.

Figure 4.3. Nomadic tribal movements and the location of khuts on the Butana Plain.



Source: J.H.G.Lebon. Land Use in Sudan. World Land Use Survey. Monograph No. 4. Bude. 1965. p.116.

67.17 per cent of the total male population of the area. If this percentage is then applied to both the total nomadic and the total male settled populations, standing at 42,009 and 47,467 respectively, figures for the numbers gainfully employed in each group can be estimated, giving figures of 28,217 and 31,884 respectively. As the number giving farming as their primary occupation was 38,660 - compared with a figure of 17,848 who gave their primary occupation as shepherding (14) - it is clear that the number of farmers exceeds the number of settled males who are gainfully employed. The explanation for this phenomenon, evident in both sources of data, is to be found in the nature of nomadism which has been and indeed still is practiced on the Butana. Thus, the predominant form of nomadism on the plain is of an essentially semi-nomadic nature, though involving different sorts of semi-nomadism. Some groups include within their nomadic existence a degree of cultivation: for example,

> ". . . . . the Shukria cultivate in the lower part of the khors draining west from the district south of Jebel Reira". (15)

Such agricultural practices play an essentially subsistence role in the nomads' economy, being limited by the pattern of rainfall to the rainy season and the period immediately following it: ie, from August to November. In other groups a proportion of the population may be completely sedentary, while the remainder migrate with the herds, as Lebon has noted of the Atbara khut:

> "Camels of the Atbara section of the Shukriya likewise graze far into the Butana during the dry season, but this section also contains many near-sedentary tribesmen, who live the most part close to the Atbara, cultivating patches both on the flood-plain and on the clay plain buffs, and who keep cattle, sheep and goats, rather than camels". (16)

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(14) All figures relating to occupation are taken from the First Population Census of Sudan, 1955/56 op. cit.

(15) Cartographic Survey of Sudan 1:250,000 Series, Map 55-D Reira, dated February 1949.

(16) J. H. G. Lebon op. cit. p. 117.

This type of adaptation is more common on the fringes of the plain where the rivers - the Atbara in the east, and the Nile, Blue Nile and Rahad in the west - provide a more reliable and permanent source of water than elsewhere on the plain. In either adaptation the way of life involves farming to a greater or lesser extent, which probably explains why the number of farmers in the population prior to the instigation of the scheme exceeds the number of shepherds.

The preceding discussion clearly shows that the majority of the non-Nubian settlers on the scheme at Khashm el Girba have been drawn largely from nomadic and semi-nomadic groups, from in and around the area that the scheme now occupies. But, before continuing to discuss the numbers involved in the settlement, a brief comment should be made regarding the reliability of the Census data in relation to nomadic groups. It was openly admitted at the time of the Census that in many areas underenumeration of nomadic peoples had occurred (17). In the north of the country this was largely due to the fact that enumeration in some areas took place at a time when semi-nomadic peoples were at a settled stage of their annual migration, and thereby were enumerated as settled (18). A re-estimation has been attempted by Henin at the provincial level (19). For Kassala Province the Census gives a nomadic population of 502,000 or 53.3 per cent of the total population (20), while Henin arrives at a re-estimated figure of 551,000 or 58.6 per cent of the total (21). The difference represents a proportionate

(17) K. J. Krotki "Twenty-One Facts About the Sudanese", Khartoum 1958,

(18) R. A. Henin (b) "A Re-Estimation of the Nomadic Population of the Six Northern Provinces". In S. N. and R. Vol. 47, 1966

(19) Ibid.

(20) First Population Census of Sudan 1955/56 op. cit.

(21) R. A. Henin (b) op. cit.

discrepancy of approximately 10 per cent, which, in comparison to the discrepancies observed for the other 5 provinces in the north, is small (Table 4.4). It can, therefore, be inferred that for Kassala Province as a whole the underenumeration of nomads represented a small error, and, carrying the inference further, that the same statement can also be applied to the Census area of Gedaref North.

4.3 Numbers Involved In The Settlement

4.3.1 Introduction

Having established that the settlement that has taken place on the scheme has involved people of largely nomadic or semi-nomadic origin, with the exception of the resettled Nubians from Wadi Halfa, it is now necessary to examine the scale at which this settlement has occurred. The central hypothesis of this section may, therefore, be stated as follows:

> That the numbers envisaged as settling on the scheme have been achieved according to the prescribed schedule.

In order to examine this contention it is necessary to refer to the government's intentions and aims, both at the scheme's inception, and also as more land came to be developed under the scheme's organisation. Unlike the situation of the settled Nubian population, the settlement of local tribes on the scheme received comparatively little pre-settlement investigation and planning. This is reflected in the report prepared by the I.L.O. for the Sudanese Government on the subject, which states:

> "It is clear, however, that a definite 'programme' had not yet been completely worked out when the I.L.O. was approached by the Sudanese authorities". (22)

The approach mentioned had taken place early in 1963 (23), and at this stage the priority of the authorities engaged in the scheme was undoubtedly the resettlement of the Nubian population, but even at this time some 25,000 feddans

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(22) I.L.O. op. cit. p. 14.

(23) Ibid. p. 14.

Table 4.4. Discrepancy in the estimates of nomadic populations in the 1955/56 Census for the six northern provinces.

province	Population Census total pop'n	Population Census nomadic pop'n	Population Census percentage nomadic	Henin re-estimate nomadic pop'n	Henin re-estimate percentage nomadic	percentage discrepancy
Blue Nile	2,070	124	6.0	337	16.3	171.8
Darfur	1,329	266	20.0	691	52.0	159.8
Kassala	941	502	53.3	551	58.6	9.8
Khartoum	505	53	10.5	81	16.0	52.8
Kordofan	1,762	394	22.4	493	27.9	25.1
Northern	873	67	7.7	238	27.3	255.2
total	7,480	1,406	18.8	2,391	32.0	70.1

All population figures are in 000s.

Sources: Republic of the Sudan(v). Ministry for Social Affairs. Population Census Office. First Population Census of Sudan. 1955/56. Final(9th) Interim Report. Khartoum. 1958.

R.A.Henin. "A re-estimation of the nomadic population of the six northern provinces." in: S.N.&.R. Vol. 47. 1966.

of the proposed area of the scheme were to be developed for the settlement of the local nomadic tribes (24), which would be able to accommodate some "8 to 10 thousand people" (25). This figure, however, referred only to the initial stages of development on the scheme, for in the long term the scheme aimed at "the settlement of some 70,000 nomads" (26). It is this second figure which it is intended to examine in attempting to assess the success in numerical and physical terms of the scheme in settling nomads. However, a further figure is also important - the number of tenancies to be allotted to the settling nomads, which was fixed at 16,000, out of a total number of tenancies of 22,000 (27).

4.3.2 Tenancy Adoption

Before analysing the success of settlement in overall terms, it is worthwhile examining the scheme's development through the rate of actual settlement in comparison with the rate of planned settlement. Table 4.5 shows the planned stages in the development of the scheme, the implementation of which was intended to be fully completed by 1970. In relation to the settlement of nomads on the scheme it is the final 4 Phases which are of prime importance, as the First Phase was almost exclusively concerned with the resettlement of the Nubian population, and the establishment of the sugar plantation. The actual allocation of tenancies is shown in Table 4.6, which shows that, by season 1973/74 the full quota of tenancies had been allocated. The original estimate of 22,620 tenancies in all phases of the scheme was later reduced to 22,000, and it was this lower target that was achieved in season 1973/74. The projected and actual

(24) Ibid. p. 13.

(25) Ibid. p. 17.

(26) Letter from the Under-Secretary to the I.L.O., quoted in ibid. p. 14.

(27) Personal communication: A.P.C. Khartoum.

Table 4.5. The planned development of the scheme at Khashm el Girba.

phase	years of implementation	no. of tenants	area(feddans)
I	1964 - 1966	7,000	163,192
II	1966 - 1967	5,900	85,445
III	1967 - 1968	2,800	43,400
IV	1968 - 1969	3,720	58,515
V	1969 - 1970	3,200	37,110

Source: A.P.C. Khartoum.

Table 4.6. Actual allocation of tenancies at Khashm el Girba.

year	no. of tenants
1964/65	3,073
1965/66	6,593
1966/67	10,675
1967/68	14,151
1968/69	18,321
1969/70	20,495
1970/71	21,475
1971/72	21,477
1972/73	21,900
1973/74	22,000

The figures presented are cumulative from year to year.

Source: A.P.C. Khartoum.

progress of settlement on the scheme are compared in Table 4.7, which reveals that it was only during the early Phases (I and II) and the final Phase (V), that the actual rate of settlement fell behind the planned rate, whereas in Phases III and IV the actual numbers settled exceeded the projected figure, thereby making up some of the deficit incurred during the early Phases of the scheme. Indeed, by the planned date for the completion of the allocation of tenancies - 1970 - actual allocation was at a level just below 91 per cent, which represents a remarkably high rate of implementation. In order to place the performance of the scheme at Khashm el Girba in physically settling its population in the correct context, it is necessary to compare it with other settlement schemes.

Settlement schemes, whether they involve the settlement of nomads, the resettlement of a displaced population, or the villagisation of scattered agriculturalists, have been a popular means of promoting, or attempting to promote, agricultural development in the countries of Africa and the Middle East, in both the colonial and the post-colonial periods. Such attempts at settling or resettling large populations have not always been as successful or all-embracing as originally intended.

Thus, for the Mwea scheme in Kenya, it is interesting to note that against:

> ". . . . . the 10,000 families which in 1956 it was hoped ultimately to settle on Mwea, only 1,588 had become tenants by the end of 1966". (28)

This represents a settlement rate of 15.88 per cent of the originally projected figure. Similarly, in Uganda:

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(28) R. J. Chambers "Settlement Schemes in Tropical Africa: A Study of Organisations and Development", London 1969 p. 251.

Table 4.7. Comparison of planned and actual performance in settlement on the scheme.

year	phase	planned settlers by year	planned settlers cumulative	actual settlers by year	actual settlers cumulative	discrepancy by year	discrepancy cumulative
1964-66	I	7,000	7,000	6,593	6,593	- 407	- 407
1966-67	II	5,900	12,900	4,082	10,675	- 1,818	- 2,225
1967-68	III	2,800	15,700	3,476	14,151	+ 676	- 1,549
1968-69	IV	3,720	19,420	4,170	18,321	+ 450	- 1,099
1969-70	V	3,200	22,620	2,174	20,495	- 1,026	- 2,125

Source: A.P.C. Khartoum.

> ". . . . . a total of 17,500 Bakiga men, women and children at a rough estimate, were resettled on an organised basis between 1955 and 1961. This falls considerably below the original target of 80-100,000 persons by mid-1960". (29)

By 1961, therefore, actual settlement had reached between 17.5 per cent and 21.87 per cent of its projected target. A further example can be taken from the Pilot Village Settlements of Tanzania, where, of a projected total of 60 villages with 250 farmers each:

> ". . . . . only 8, most of them only partially settled, had been created by April 1966 when the programme's suspension was announced". (30)

The above examples illustrate that the physical settlement of populations may not always run smoothly, and thereby show the scheme at Khashm el Girba up in a favourable light. The lack of success of such schemes is attributable to certain, often insurmountable, problems, and to attempt to achieve an understanding of why Khashm el Girba has been more successful in its attraction of settlers it is necessary to examine some of the factors influencing the performances of these and other schemes in Africa and the Middle East. This analysis will be left until the performance of the scheme has been examined in its entirety (31).

4.3.3 Overall Population

The discussion so far has presented a favourable picture of the scheme's performance in settling nomads, but the situation has only, so far, been examined in relation to the adoption of tenancies. This angle of approach, however, represents a somewhat misleading impression of the overall

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(29) D. G. R. Belshaw "An Outline of Resettlement Policy in Uganda 1945-63". In R. J. Apthorpe (ed) 'Land Settlement and Rural Development in Eastern Africa', Nkanga Editions No. 3, Kampala 1968 p. 18.

(30) R. J. Chambers op. cit. p. 251.

(31) See Chapter Eight.

situation, for it neglects 2 very important aspects connected with the settlement of nomads on the scheme: first, it omits the proportion of the population which has settled but which does not hold tenancies on the scheme; and second, which is perhaps more important, it includes that proportion of the population which has taken up tenancies but which is, nevertheless, absent from the scheme for a part or even the whole of the year. This proportion of the population has rather included the scheme as a further adaptation to its environment, and therefore, another point upon its migratory cycle. In this section, therefore, it is intended to try and estimate the numbers involved in such an adaptation, and thereby to reach an estimate of the numbers actually settled on the scheme, as opposed to the numbers who have taken up tenancies only.

The original projection for the number of nomads to be settled on the scheme was given as approximately 70,000 (32), a figure which seems to have been reached by multiplying the number of tenancies to be allocated to local nomads - 16,000 - by the average family size of the inhabitants of the area - the survey conducted by the Health Department in New Halfa arrived at a figure of 4.15 - for such a calculation gives a total of 66,560. It would, therefore, seem that the original projection by the government was based on the number of tenancies to be allotted to local nomads. Consequently, inhabitants settled for other reasons can be regarded as a bonus, while conversely absentee tenants and their families must be regarded as a deficit.

In terms of the total numbers settled, the most recent and indeed, virtually the only estimate of the settled non-Nubian population on the scheme comes from the Health Department Survey of December 1973 and January 1974. This survey divided the area into 2 sections: the riverain

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(32) See page 117.

area and the New Extensions, which contain 8,959 and 12,294 persons respectively, giving an overall total population of 21,253, which represents 30.3 per cent of the projected 70,000 settlers, a figure far below the rate for adoption of tenancies, standing at 90.95 per cent, and which more closely approximates to, but is still higher than the figures presented for other schemes in Africa (33). These figures also tie in with an estimate given in a regional geography of the area, which states that:

> ". . . . . between 1964 and 1969 over 15,000 persons moved from the Central Butana to Khashm el Girba scheme area". (34)

Although this figure exceeds the figure of just over 12,000 presented earlier for the New Extensions, some of the discrepancy, at least, can be accounted for by the fact that, as will be shown later, some of the settlers from the Central Butana moved to the riverain area as opposed to onto the scheme itself.

From these figures it can be seen that physical settlement on the scheme has not been as successful as it would initially appear from the figures relating to tenancy adoption, but these figures are not conclusive, and could be open to more than one interpretation. The most obvious conclusion to be gathered from the figures is that not all the population who have adopted tenancies on the scheme have necessarily become settled on the scheme, but such a statement is based on the assumptions that either tenancy holders come to the scheme with their families, and/or that each family may be restricted to one tenancy only, whereas neither of these assumptions may be correct. To examine, therefore, the validity of the statement it is necessary to assess the degree of absenteeism amongst

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(33) See pages 120-122.

(34) M. H. Abu Sin "The Regional Geography of the Butana North of the Railway", M.A. Thesis, Khartoum 1970 p. 59.

non-Nubian tenants. As records relating to this phenomenon from official sources are at worst non-existent and at best unreliable, the question had to be approached using 2 other sources of information: the author's questionnaire survey, and the Health Department Survey.

In the questionnaire survey a question was presented relating to the maintenance of tenancies other than the tenants' own, (see Appendix A). From the information received from this question it was possible to estimate, for each village surveyed, the number of tenancies looked after by a person other than the registered tenant, in relation to the number of tenancies looked after by the registered tenant, from which relationship an estimate of the rate of absenteeism could be reached. The results of these calculations are summarised in Table 4.8, which shows an average rate of absenteeism for the 6 villages as a whole of 24.71 per cent.

An alternative method for estimating the degree of absenteeism was possible by making use of the Health Department Survey data in conjunction with the data taken from the questionnaire. With regard to the information from the Survey, it is worth noting its purpose: it was not conducted for academic reasons, but so that the Malaria Section of the Health Department could estimate the amounts of spray required to counteract the threat of malaria on the scheme. Consequently, the Survey only included those inhabitants settled in villages. In using the information, therefore, this factor needs to be taken into account, because as such the information used discounted both individual dispersed settlement, and also transitory inhabitants of the villages. As a result, certain assumptions had to be made: first, not all households on the scheme have tenancies - in relation to this assumption information from the questionnaire survey was used to arrive at an estimate of how many households did not have tenancies, and a proportion of 11.72 per cent reached; second, not all the settled population of the scheme was included in the Survey data. An estimate of

Table 4.8. Rates of absenteeism of the tenants in six selected villages on the scheme.

village	no. of tenants	no. of tenancies cultivated in lieu of tenant	total no. of tenancies	per cent no. of tenancies looked after by person other than tenant
Wad Nabar	21	8	29	27.59
Umrahau	28	7	35	20.00
New Geili	15	3	18	16.67
New Reira	24	6	30	20.00
New Baraysi	19	3	22	13.64
Arrida Shukriya	21	15	36	41.67
total	128	42	170	24.71

Source: Author's questionnaire survey.

the numbers settled outside villages was, therefore, necessary, but had to rely largely on observation and interviews with local officials. From these sources, it was estimated that between 2,000 and 3,000 households might be located outside the villages, but again, not all such households need necessarily have tenancies, some being the households of agricultural labourers. In order, therefore, to reach a closer estimate of numbers holding tenancies, field officers were contacted, who, it was felt, would have a closer knowledge of the actual field situation. Estimates were thus received for the 3 blocks in which non-Nubian settlers were situated, namely Umrahau, Kilo 65 and Saba'at (35), which yielded figures of 400 to 500, about 600 and 500 to 600 respectively, giving an approximate total for the whole area of 1,500. This figure was subsequently utilised in the analysis.

Basing calculations upon these assumptions, about 4,500 of the 5,138 households in the villages held tenancies, while a further 1,500 tenancies are accounted for by settled former nomads living outside the villages, giving a total of 6,000 tenancies altogether, which would mean that approximately 62.5 per cent of tenancies allocated to nomadic settlers are held by tenants who have not, in fact settled upon the scheme in any permanent sense, and this figure represents a much higher proportion than the 24.71 per cent obtained in the previous estimate. Because of the nature of the information upon which the estimates are based, they must be regarded with some caution, although, perhaps, serving as the upper and lower limits at which absenteeism on the scheme can possibly run. In spite of this reservation it is maintained that the figures do indicate the commitment to the scheme is not as great as the figures for tenancy adoption appear to show, and also that physical settlement on the scheme has not necessarily accompanied the adoption of a tenancy. A similar situation has been

(35) For an explanation of the Block organisation see page 87.

observed for the Nubian population at Khashm el Girba, where Sorbo noted for one village only, an absentee rate of 25 per cent, but it must be further noted that "the A.P.C. regards this village as one of the best" (36), implying that higher rates are to be found in other villages. However, other sources give the absentee rate as 23 per cent over the whole scheme, a Census taken in 1969 giving the total Halfan population as 49,716, of which 11,153 were absentees (37).

4.4 Types Of Settlement

4.4.1 Introduction

Having established the degree to which settlement has occurred on the scheme, it is now intended to examine the ways in which such settlement has taken place. The main focus of settlement on the scheme has been the village, although the 2 urban centres of New Halfa and Massna have also acted as foci of attraction to settlers. In addition, although to a lesser extent, a more dispersed form of settlement has occurred. In the case of settlement in villages it is first of all necessary to make a distinction between 2 types of village on the scheme, and these types tend to correspond closely, although not exclusively, to the 2 main source areas for settlers on the scheme. Thus, those settlers whose traditional home area or dar was located near the River Atbara have tended to settle along the river in the more established settlements, whereas those originating from the central Butana have preferred to settle in the new villages established on the scheme itself. This contention can be presented more formally in the following hypothesis:

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(36) G. Sorbo (b) "Economic Adaptations in Khashm el Girba", African Studies Seminar Series No. 11, Sudan Research Unit, Faculty of Arts, University of Khartoum 1972 p. 14.

(37) H. M. Fakim "Nubian Resettlement in the Sudan", Field Research Projects, Miami 1972 p. 20.

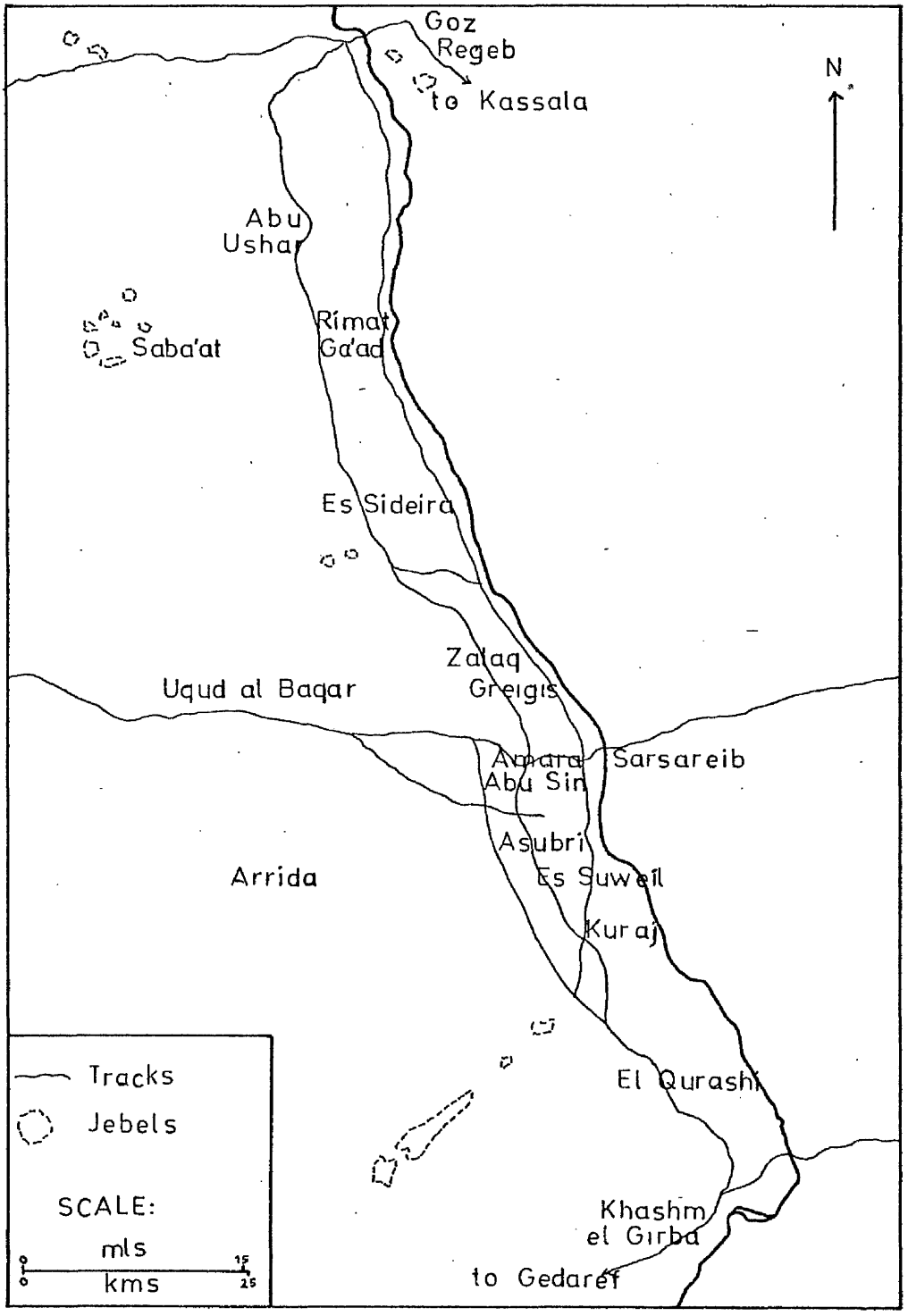
> That settlers originating from the River Atbara area have settled in those settlements along the river, while settlers originating from the central Butana have settled on the new villages on the scheme.

To examine this hypothesis, it is intended to look at each of the 2 types of settlement separately, and subsequently to examine the other types of settlement which have taken place on the scheme.

4.4.2 River Atbara Settlements

As outlined in the first part of this chapter, the way of life of many of the settlers prior to the scheme was of a semi-nomadic nature, and this is particularly true of the Atbara section of the peoples of the Butana, to such an extent that even prior to the scheme's inception some villages of a permanent nature had been established. Such villages as Goz Regeb, es Sideira and Al Gafalla are marked on early maps of the region (Figure 4.4), while more recently other traditional tribal centres have begun to acquire a degree of permanency, following the provision of health and education facilities by the government, a notable example being provided by the village of Umrahau, where a school and dispensary were established in 1958, and where a certain amount of permanent settlement had taken place prior to the scheme's development. From this evidence it is possible to say that even prior to the scheme, settlement, albeit at a slow rate, was already taking place in the region of the Atbara river. The implementation of the scheme undoubtedly hastened this process, and encouraged more people to settle permanently either around existing villages, or in new ones established near to the river. Before examining the possible factors influencing such settlement it is necessary to establish the origins of the settlers to test the hypothesis presented earlier. To do this it is necessary to refer again to the questionnaire survey, more particularly to that part of the survey conducted in the villages along the river, namely Wad Nabar and Umrahau.

Figure 4.4. Location of early centres of settlement along the Atbara River.



Source: Cartographic Survey of Sudan. 1:250,000 Series. Map 55-D Reira, dated Feb. 1949, and Map 45-P Goz Regeb, dated April 1939.

It was to be expected that, because this area already had existing inhabitants focussing around established centres, the population who regarded the area as their particular home would tend to settle there rather than undertake the move, however short it may be, to the newly-created villages on the scheme itself. If this were true, therefore, the process which would have occurred along the River Atbara would have been one by which the population became more fixed to their centres, rather than one by which the population moved to a different area to resettle. The results from the survey conducted in Wad Nabar and Umrahau lend support to this contention, in that 88 per cent of the population of Wad Nabar originated from around that village, and 70.5 per cent of the population of Umrahau originated from Umrahau. These figures indicate that while the majority of the settlers in these villages are of local origin, the villages have also served to attract settlers from elsewhere. In the case of Wad Nabar, of the remaining 12 per cent of the inhabitants, 8 per cent originated from other places along the Atbara, such as Al Gafalla, while for Umrahau the vast majority of the remaining percentage came from the central Butana, with 23.5 per cent originating from Sobagh, and 3 per cent from Sufeiya (Table 4.1.). Thus, immigration into the riverain area from the central Butana has taken place, but, as will be shown in the next section, a degree of emigration from the riverain area to the new settlements is also taking place.

The scheme has, therefore, encouraged the existing population of the riverain fringe to become more permanently settled, even though, as was intimated earlier, this process may have been in progress already. It remains now to suggest ways in which settlement has been encouraged by the presence of the scheme. Undoubtedly, the major influence of the scheme in the area has been the availability of tenancies, which require, if worked properly, regular attention for 8 or 9 months of the year, thereby demanding

some degree of permanency of settlement. But, another factor related to the scheme may also be of importance, for the presence of the scheme has placed a physical barrier to the traditional migratory pattern of the nomadic groups of this part of the Butana. Formerly the pattern was one involving direct movement between the central Butana and the land adjoining the river, with certain exceptions (38), following the pattern of Johnson's pulsatory nomadism (39). In addition, the Lahawin tended to migrate in a north-south direction, parallel to the river (40), as shown in Figure 4.3. The physical presence of the scheme has, however, enforced a change to take place in this traditional pattern. Thus, the migration from the Atbara to the central Butana in time for the rains can still take place in a direct line, as at this time of the year - June - the scheme is not closed to animal incursions. But for their return in January and February the scheme is at the climax of its agricultural year, as the cotton and wheat crops are both near their time for harvesting. Consequently, the animals must be driven around the scheme, to either north or south. Difficulties are presented by such a change in the migration pattern at a time when grazing resources are particularly scarce, and this may have been a further factor in encouraging some of the inhabitants of the riverain fringe to adopt a more settled way of life.

In summary, settlement along the River Atbara has taken place around existing villages and nuclei, such as Sideira and Al Gafalla, but other villages have also grown up, among them, Kindowa and New Shelakay. Appendix D shows the populations of these villages, and their location is shown in Figure 4.5. On the whole, therefore, the settlers in the riverain fringe originate from the riverain area although some have come from the central Butana.

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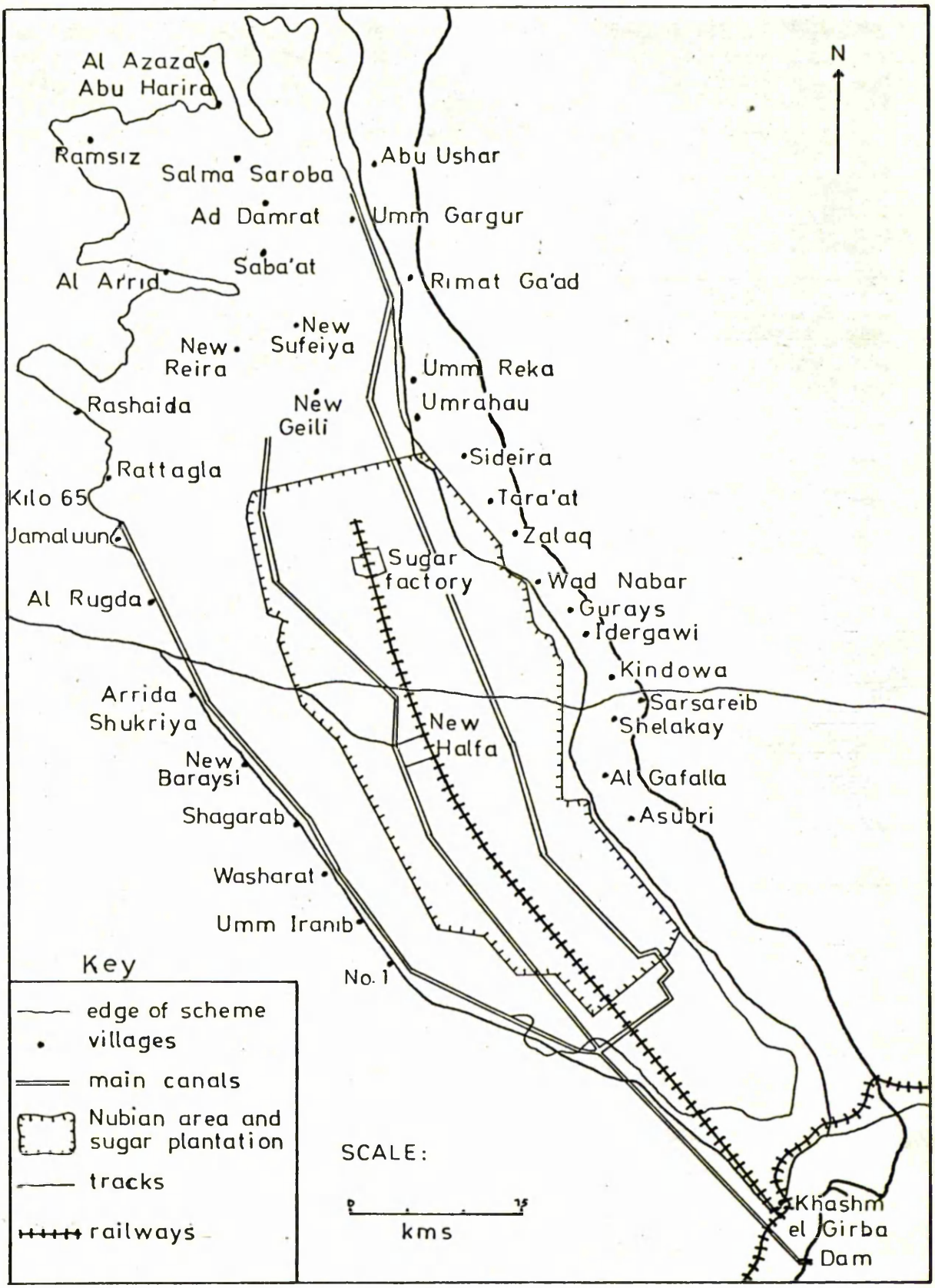
(38) See pages 79-80.

(39) D. L. Johnson "The Nature of Nomadism: A Comparative Study of Pastoral Migrations in South-Western Asia and North Africa", Department of Geography, University of Chicago, Research Paper No. 118, 1969 p. 166.

(40) J. H. G. Lebon op. cit. pp. 116-117

Figure 4.5. Location of villages on the scheme.



4.4.3 New Settlements Within The Scheme

With the implementation of Phases II to V and the consequent settlement of nomads on the scheme, sections of land within the area or at its western fringe were set aside to provide what were intended to be planned villages for the settlers. Such villages were very much intended to follow the pattern established in the Nubian area of the scheme, where the physical structure of the villages had been planned and controlled in great detail, to the extent that each house, shop and functional building was designated a specific location. The implementation of such detailed planning in the case of the settling former nomads, however, proved unfeasible for 2 important reasons: first, unlike the Nubians, the settling nomads were not provided with ready-built housing and facilities; instead they were given materials to the value of LS 9, with which to construct their own dwellings (41), while in only some of the villages were schools and health facilities installed by the government. Second, the rate of settlement of the nomads was haphazard and variable, so that the government did not have the same degree of control over their movement into the scheme, as was possible in the case of the Nubians. Consequently, settlement on the scheme by nomads, although it did concentrate in those areas set aside by the government for village development, within these areas took place in an apparently haphazard and unplanned fashion, although the villages now exhibit their own internally logical spatial organisation, based largely on the extended family system, whereby the members of an extended family group congregate in one part of the village, and that part of the village is recognisable as belonging to that group (42).

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(41) R. F. Wynn "The Khashm el Girba Scheme 1964/65-1966/67: An Economic Review", African Studies Seminar Paper No. 1, Sudan Research Unit, Faculty of Arts, University of Khartoum 1968, p. 18.

(42) For an example of the spatial organisation of a village see Appendix E.

The populations of these villages come largely from the central Butana, and among the tribal centres being specifically mentioned are Abu Duleiq, Sufeiya, Sobagh, Reira and Geili (Figure 4.1). For example, in the questionnaire survey conducted in New Geili, all interviewees originated either from Abu Duleiq (40 per cent) or from Sufeiya (60 per cent), while in the village of Arrida Shukriya only 8 per cent of the population came from places other than the central Butana. Further support is lent to this, when the names of the villages on the scheme are compared with the names of tribal centres in the Butana. Thus, there are the villages of New Geili, New Sufeiya and New Reira on the scheme, and the centres of Geili, Sufeiya and Reira in the Butana.

At the same time there has been movement from the established villages along the River Atbara into the new villages, encouraged by the latter's closer proximity to the tenancies. Thus, nearly 10 per cent of the population interviewed in New Baraysi and 8 per cent of the population in Arrida Shukriya originated from places by the river, (Table 4.1). A proportion do have origins elsewhere, some coming from the western Butana, around Rufa'a, or from the north around Berber and ed Damer, while one individual originated from Managil. On the whole though, the origins of the settlers in the new villages tend to be the central Butana, and to a lesser extent the riverain area.

The question of numbers settled on the scheme has been dealt with in some detail previously, but in the new villages alone over 12,000 people are estimated to have been settled (43). The populations of these villages are given in Appendix F, and their locations shown in Figure 4.5.

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(43) See page 124.

In relation to the hypothesis presented at the beginning of this section, to the effect that people from the central Butana have settled in the new villages, and those from the riverain area in the established villages of that area, the preceding discussion suggests its general veracity, with one or 2 exceptions, notably relating to the settlement of people from the River Atbara area in the new villages on the scheme.

4.4.4 Non-Village Settlement

Although the vast majority of settlement which has taken place on the scheme has occurred in the villages, other forms of settlement not based upon the village have taken place. Such settlement can be divided into 2 types: settlement occurring around the 2 urban centres of New Halfa and Massna; and settlement occurring throughout the scheme and of a dispersed nature.

a) Settlement Around New Halfa and Massna. On the edges of, though outside, both the towns of New Halfa and Massna, small groups of settlers have congregated. Outside New Halfa 2 such areas are to be found: one to the south-east by the railway line, and one to the west, just off the main road to Khartoum, (Figure 4.6). The population of both areas tends to vary, because settlement is not always of a permanent nature: many arrive immediately after the end of the rains and remain for the rest of the year. Inevitably, a proportion remain throughout the year and have become permanently settled. Any estimate of the numbers involved must rely on observation, which must be based on the type of dwellings constructed in these areas, tent-like structures being taken to represent a lack of permanence, whereas other structures, gutiyas, built largely in the shape of conical huts, and being frequently surrounded by stakes, being taken to represent a degree of permanence (Figures 4.7 and 4.8). In view of these considerations the numbers that could be regarded as settled on a permanent basis are comparatively small, amounting to some 20 households to the west of New Halfa and some 35 households to the south-east. Around

Figure 4.6. Location of squatter settlements outside the towns on the scheme.

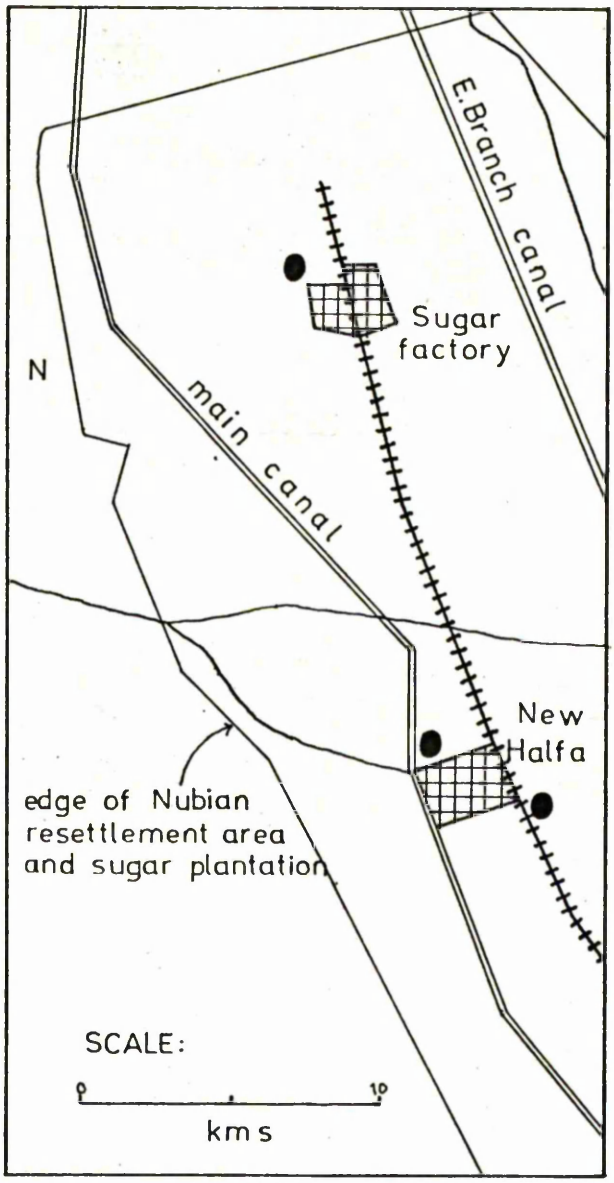

Figure 4.7. The traditional tent dwelling of the nomads of the area.

Figure 4.8. The gutiya dwelling of nomads now settled on the scheme.

Massna, where the settlement occurs largely to the west, the number approximates to some 25 households.

It remains to examine the attraction of the scheme, or rather its towns, to such settlers. The most obvious attraction would appear to be the industry present, albeit on a small scale. At Massna there is the sugar factory, which employs 1,000 people permanently and a further 5,000 to 6,000 on a seasonal basis, while in New Halfa there is a flour mill (52 employees), an oil-processing factory (65 employees) and 2 ice factories (34 employees), along with numerous small-scale handicraft and engineering concerns. However, interviews conducted in these factories revealed that, with one or 2 individual exceptions, the labour force was drawn from neither the local Nubian nor the local Arab populations, but rather consisted of people from the southern or western Sudan. Interviews conducted amongst the settlers outside the towns supported this information, for the chief reason given for their presence on the scheme was the sale of milk to the townspeople. Thus, part of the family settle with a few animals outside one of the towns, while the other members herd the rest of the livestock outside the scheme: the settled section sell their milk to receive enough money to enable them to live. But the towns also act as centres of attraction in a social sense, for they contain health facilities, not only for the human population, but also for their livestock, which are at their most efficient in the towns, education facilities if required, and also entertainment in the form of cafes and a cinema if it can be afforded.

Such settlement has been until the present on a very limited scale, but must be regarded as of some importance, because it has taken place outside the planning framework of the scheme - it is settlement of a spontaneous nature, encouraged by the economic and social benefits to be found in the vicinity of the towns. On the other hand, it should be regarded with some reservation, for it is settlement which is based upon a

continued dependence on livestock, and has, as yet, not been accompanied by a changeover from the traditional values held prior to settlement.

b) Dispersed Settlement Throughout The Scheme. Any quantitative assessment of the extent and importance of this type of settlement must be regarded with some suspicion, and will not be attempted here for 2 main reasons. First, this settlement occurs throughout the scheme, and, due to the limitations outlined earlier (44) field enumeration was impossible, while no air photographs of the scheme area at present exist. Second, some of this dispersed settlement involves people of semi-nomadic origin, but in many cases the people settling are from the west or the south of the Sudan. It is impossible, therefore, to reach any reliable estimate of the total numbers involved in such settlement, although the estimates received from field officers and referred to earlier (45) suggest that there might be some 1,500 households with tenancies scattered throughout the scheme, outside the villages, but in addition, many of the agricultural labourers on the scheme live on or near the tenancies. An indication of the extent of this settlement connected with certain villages is possible from the questionnaire survey, in which a question was asked relating to the place of residence of a tenant's hired labour (Appendix A). The findings are summarised in Table 4.9, but the figures only include the proportion of the population of hired labourers whose tribal origin was nomadic: viz, the Beni Amer, Hadendowa, Shukriya and Rashaida. Thereby, labour of Fur or Zaghawa stock are not included, as those tribes originate from the western and southern Sudan. As the table shows, an extremely large proportion of the hired labour does, in fact, reside on the tenancy, and the use of hired labour in general is seen to be widespread. No indication

(44) See pages 39-41.

(45) See page 127.

Table 4.9. Place of residence of hired labour in six selected villages on the scheme.

village	no. of tenancies(a)	hired labour used: no. nomadic origin(b)	(a):(b)	percentage living on tenancy
Wad Nabar	21	41	1.95	100.00
Umrahau	28	50	1.79	100.00
New Geili	15	16	1.07	75.00
New Reira	24	15	0.63	73.73
New Baraysi	19	29	1.53	72.42
Arrida Shukriya	21	37	1.76	89.89

Source: Author's questionnaire survey.

of actual numbers involved can be taken from the figures presented, but they do show that the phenomenon of hired labour living in fields in a scattered fashion is widespread.

4.5 Conclusions

In relation to the physical settlement of nomads on the scheme, the preceding discussion has shown that the population involved originated from 2 main areas: the central Butana and the fringe of the plain by the River Atbara, and that this population was largely of nomadic or semi-nomadic origin prior to the scheme's implementation. However, in terms of gauging the success of the settlement, different criteria can be used: thus, in relation to the adoption of tenancies the scheme's performance has been impressive, actual rate of settlement falling only slightly behind the planned rate of settlement. However, with regard to actual numbers settled, the performance has been less impressive, about 20,000 people out of a projected total of about 70,000, having settled permanently. Others although they have taken up tenancies, only include the scheme as a further adaptation to their environment. Whether such an adaptation represents a failure in terms of the scheme's assessment will be discussed later. Overall, therefore, the physical settlement of nomads on Khashm el Girba cannot be said to have been an unqualified success, but, with reference to the original hypothesis of the chapter, the scheme has managed to effect the settlement of large numbers of peoples of nomadic and semi-nomadic origin from the surrounding areas.

CHAPTER FIVE

ECONOMIC ASPECTS OF THE SETTLEMENT (1)

5.1 Introduction

In examining the economic aspects of the settlement of nomads at Khashm el Girba, several points need to be considered. The economic impact of the scheme on the settlers themselves is obviously important but it is also necessary to consider the national implications of the settlement. The former aspect will be considered in the next chapter, but it is the purpose of this chapter to examine the national consequences of the settlement of nomads on the scheme. One of the criticisms which has been levelled at pastoral nomadism is that its contribution to the national economy is minimal (1). In consequence, this argument is used to justify the process of settlement. This chapter is concerned with examining this point in relation to the nomads of the area around Khashm el Girba, and by so doing, assessing whether the settlement of a proportion of these nomads has led to their greater contribution to the Sudan's economy. In addition it is necessary to examine whether the funds which the government disbursed on the settlement of these nomads has proved justifiable. Accordingly this chapter will be divided into 2 parts, dealing with each of these aspects in turn.

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(1) See pages 58-59.

5.2 Contribution To The National Economy

5.2.1 Introduction

The central hypothesis of this section may be stated as follows:

> That the settlement of nomadic and semi-nomadic peoples on the scheme at Khashm el Girba has led to their greater contribution to the economy of the Sudan, through their participation in cash-oriented agricultural production.

The examination of the above hypothesis will be divided into 3 parts, each of which will be dealt with separately before a comparative analysis is attempted:

a) The contribution of the nomads of the area to the Sudan's economy prior to the establishment of the scheme.

b) The present contribution of the nomads in the area bordering the scheme to the Sudan's economy.

c) The contribution of agricultural production on the scheme, practiced by the former nomads, to the economy of the country.

5.2.2 The Nomadic Contribution To The Economy Prior To The Scheme

Although nomads have been criticised for their poor contribution towards their countries' economies, it has been shown previously that this need not necessarily be the case (2), and, indeed, for the Sudan livestock and livestock products, which are almost exclusively produced by nomadic and semi-nomadic peoples (3), constitute a not insignificant proportion of export earnings, and have done so for many years (Table 5.1), as well as being able to meet most domestic needs. It has been contested elsewhere, however, that:

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(2) See page 60.

(3) See for example I. M. Khalil "Developing the Animal Wealth in the Sudan". In S. N. and R. Vol. 41, 1960 pp. 6-21, and M. S. Bayoumi "Cattle Improvement in the Tropics". In S. Journ. of Vet. Sci. and An. Husb. Vol. 5 No. 1, March 1964 p. 59.

Table 5.1. The contribution of the livestock sector to export earnings in the Sudan. 1966 - 1973.

year	total export earnings(LS mn)	export earnings from livestock(LS mn)	per cent contribution of livestock
1966	69.782	4.585	6.57
1967	74.059	4.315	5.83
1968	80.834	4.532	5.61
1969	86.251	4.369	5.07
1970	103.914	4.060	3.91
1971	114.374	4.000	3.50
1972	124.351	6.598	5.31
1973	152.238	13.756	9.04

Sources: 1966-68: UN Yearbook of International Trade Statistics. 1969. New York. 1971.

1969-73: Democratic Republic of the Sudan(a). Bank of Sudan. 14th annual report for the year ending 31st December 1973. Khartoum. 1974.

> ". . . . . the livestock sector is not a major contributor to the export trade in spite of the enormous wealth of livestock, the favourable livestock population ratio and the vast resources of labour (40 per cent of the total) and land (64 per cent of the total) engaged in livestock production". (4)

To assess the applicability of these contentions to the situation prior to the establishment of the scheme the following hypothesis was established:

> That prior to the establishment of the scheme the nomadic inhabitants of the area were making a significant contribution to the country's economy through their livestock.

To examine this hypothesis it is necessary to compare figures for the area with figures relating to Kassala Province, and also to the country as a whole. Thus, Table 5.2 demonstrates that the number of livestock in the eastern Butana constituted a very high proportion of the total numbers in Kassala Province, particularly with respect to camels and goats, but except in the case of camels only a small proportion of the country's total animal wealth. However, to more closely assess the contribution of the area to total animal wealth, it is necessary to examine turn-off rates for the animals. Gibb (5) has estimated turn-off rates for Kassala Province as a whole, and if these estimates are applied to the livestock numbers in the eastern Butana, an estimate of the numbers of livestock turned off from that area can be reached (Table 5.3). The turn-off rates for Kassala Province are generally higher than for the whole of the country, and this applies particularly to camels and goats, where Kassala Province's contribution to total turn-off exceeds 30 per cent (Table 5.4). The comparison can be extended to include the figures for the eastern Butana, where again, in the case of both camels and goats, the area's contribution is shown to be very significant, especially in relation to the area's corresponding proportion of numbers of livestock (Table 5.5).

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(4) Z. H. Abdalla "Export and Export Possibilities of Livestock in the Sudan", Dept. of Rural Economy, Faculty of Agriculture, University of Khartoum, Research Bulletin No. 19, 1971 p. 2.

(5) Sir A. Gibb and Partners "Kassala Province Survey", London 1968 p. 111.

Table 5.2. Livestock populations of the Sudan, Kassala Province and the eastern Butana. 1962.

animal	Sudan	Kassala Province nos	Kassala Province per cent Sudan	eastern Butana nos	eastern Butana per cent Kassala	eastern Butana per cent Sudan
cattle	9,102,000	250,000	2.75	106,000	42.40	1.16
camels	2,000,000	482,000	24.10	259,000	53.73	12.95
sheep	8,660,000	700,000	8.08	298,000	42.57	3.44
goats	6,854,000	400,000	5.84	234,000	58.50	3.41

Figures for Kassala Province and the Sudan are taken from Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Figures for the eastern Butana are taken from I.L.O. Report to the Government of the Sudan on the sedentarisation of nomadic tribal populations in the Butana region of Northern Sudan. Study Planning Mission. Nov 1963 - Feb 1964. ILO/TAP/Sudan/R.8. EPTA. Geneva. 1965.

Table 5.3. Livestock turn-off in Kassala Province and the eastern Butana. 1966.

animal	Kassala Province per cent turn-off	eastern Butana livestock pop'n	nos turned off
cattle	20.0	106,000	21,200
camels	5.8	259,000	15,002
sheep	28.6	298,000	85,228
goats	28.4	234,000	66,456

Figures for turn-off rates for Kassala Province are taken from Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Table 5.4. Livestock turn-off rates in Kassala Province and the Sudan.

animal	Sudan livestock population	Sudan turn-off nos	Sudan turn-off p.c.	Kassala Province livestock population	Kassala Province turn-off nos	Kassala Province turn-off p.c.	per cent Sudan turn-off
cattle	9,102,000	588,000	6.5	250,000	50,000	20.0	8.50
camels	2,000,000	79,000	3.9	482,000	28,000	5.8	35.44
sheep	8,660,000	2,214,000	25.6	700,000	200,000	28.6	9.05
goats	6,854,000	380,000	5.5	400,000	114,000	28.5	30.00

Source: Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Table 5.5. The contribution of the eastern Butana to livestock turn-off in the Sudan.

animal	Sudan turn-off(nos)	eastern Butana turn-off(nos)	eastern Butana per cent of Sudan
cattle	588,000	21,200	3.61
camels	79,000	15,002	18.99
sheep	2,214,000	85,228	3.85
goats	380,000	66,456	17.49

Not all the turn-off from Kassala Province finds its way onto the export market, for the province is self-sufficient in livestock products, producing 33,000 tons of fresh meat and 118,000 tons of fresh milk required per annum within the province (6). However, the majority of the turn-off does contribute to exports, and to achieve an extimate of the contribution of the area to the national economy through export earnings it is necessary to make reference to the country's overall export earnings from livestock and livestock products (Table 5.6). To estimate the monetary contribution of the eastern Butana, its proportional contribution to livestock turn-off in numbers needs to be applied to total export earnings from livestock, the results of which calculations are summarised in Table 5.6. In total this constituted in 1965 some LS 537,462 out of the total export earnings of the Sudan of LS 67,138,552 (7). This constitutes a proportion of 0.80 per cent. From the preceding discussion it can be seen that the area's contribution to the wealth of the country prior to the scheme, when compared with the overall contribution of the livestock sector - particularly in camels and goats - was not insignificant, although only constituting a very small proportion of the country's total export earnings. While this represents an indication of the area's contribution to foreign exchange earnings, it must also be remembered that the livestock sector is also of importance on the domestic market, providing the country with most of its livestock products, which itself represents a significant contribution to the economy of the country, but one which it is difficult to measure quantitatively.

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(6) Ibid. pp. 111-12

(7) Republic of the Sudan (g), Ministry of Finance, "Annual Foreign Trade Statistics 1965" Khartoum 1966 p. 1.

Table 5.6. Export earnings from livestock in the Sudan and in the eastern Butana. 1965.

animal	export earnings Sudan	eastern Butana per cent contribution	eastern Butana export earnings
cattle	282,698	3.61	10,205
camels	1,815,920	18.99	344,843
sheep/goats	1,709,601	10.67	182,414
		total	537,462

Figures for export earnings are in Sudanese pounds.

Separate figures are not available for sheep and goat export earnings, so that the percentage contribution for the eastern Butana was averaged out between the two animal types.

Source: Republic of the Sudan(g). Ministry of Finance. Annual Foreign Trade Statistics. 1965. Khartoum. 1966.

5.2.3 The Present Contribution Of The Nomadic Population Of The Area To The Economy

Although the scheme at Khashm el Girba was directed at the settlement of 16,000 local nomadic or semi-nomadic families, and their changeover from pastoralism to settled cultivation, such a changeover has not been completely achieved. For a large number of the ex-nomadic tenants on the scheme, livestock are still important (8). Consequently, the situation of livestock in the eastern Butana has not effectively altered: indeed, the presence of the scheme, although affecting the traditional migratory routes of the nomads of the area, has tended to improve the position, for, through the Sabir branch canal to the west of the scheme, a permanent source of water supply has been established (Figure 5.1), while the provision of many veterinary stations throughout the scheme has resulted in greater control over disease. To examine the present contribution of pastoralism in and around the area of Khashm el Girba to the national economy, the following hypothesis was established:

> That the establishment of the scheme at Khashm el Girba has not resulted in a significant decline in the contribution of the nomads of the area to the country's economy, through their livestock.

Since the end of the Second World War there has been a steady increase in the numbers of livestock throughout the country (Table 5.7), which has been largely "due to the mass immunisation campaign and disease control measures" (9), and it seems unlikely that such an increase should have stopped due to the introduction of the scheme at Khashm el Girba. Indeed, for Kassala Province as a whole a steady increase in livestock numbers is discernible

(8) See pages 249-252.

(9) M. M. Baashar "Livestock Development in the Central Rainland of the Sudan - Potential and Problems". In D. J. Shaw (ed) 'Agricultural Development in the Sudan', Proceedings of the Thirteenth Annual Conference of the Philosophical Society of the Sudan, Khartoum 1966 p. 381.

Figure 5.1. Flocks watering at the Sabir Branch Canal.

Table 5.7. Livestock population increase in the Sudan. 1948-1962.

animal	1948	1956	1962
cattle	3,500	6,960	9,102.5
sheep	5,000	6,946	8,660
goats	4,300	5,788	6,854
camels	1,500	1,410	2,000

Figures are in thousands of head.

Source: M.M.Baashar. "Livestock development in the central rainland of the Sudan - potential and problems." in: D.J.Shaw(ed). Agricultural Development in the Sudan. Vol. 2. Proceedings of the 13th annual conference of the Philosophical Society of the Sudan. Khartoum. 1966.

in the decade from 1956 to 1966 (Table 5.8). In view of the tenants continued interest in livestock and the improved veterinary services available around the scheme, it is assumed that the rate of livestock population increase for Kassala Province as a whole also holds for the eastern Butana. Thus, if the rate of increase for the years 1956 to 1966 is applied to the decade 1966 to 1976, an outline of the present levels of livestock numbers in the region can be estimated (Table 5.9). Similarly, it is assumed that turn-off rates have not declined, and indeed, there is evidence to suggest that the opposite may be the case, for interviews with local sheikhs revealed that the arrival of the scheme and its presence had gradually brought about a more commercial attitude to livestock, both amongst those settling on the scheme and those still practising pastoralism as a full-time occupation. Thus, it was admitted that prior to the scheme, animals tended to be regarded as of more value when kept than when sold, but it was stressed that such an attitude was now changing in favour of a more commercial attitude. Indeed, this phenomenon is not restricted to the scheme at Khashm el Girba, but generally accompanies the settlement of nomadic peoples (10). Estimates of the present turn-off rates in the area and in Kassala Province as a whole, are not available to back up this assertion, but Gibb has projected figures for 1975, suggesting rates of 23 per cent for cattle, 7 per cent for camels, and 31 per cent for sheep and goats, compared with the corresponding figures of 21 per cent, 5 per cent and 29 per cent respectively for 1968 (11). From these projected figures and the estimates of present livestock populations, estimates of present numbers turned-off can be obtained (Table 5.9).

(10) Sudan Economist, Special Issue "The Future of Animal Wealth in the Sudan" No. 107, November 1966 p. 42.

(11) Sir A. Gibb and partners op. cit. p. 194.

Table 5.8. Livestock population increase in Kassala Province. 1956-1966.

animal	1956	1966	percentage increase
cattle	217	250	15.21
sheep	626	700	11.82
goats	399	400	0.25
camels	328	482	46.95

Figures are in thousands of head.

Source: Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Table 5.9. Estimates of livestock turn-off in Kassala Province and the Eastern Butana. 1976.

animal	projected turn-off rate (per cent)	Kassala Province pop'n	Kassala Province turn-off	Eastern Butana pop'n	Eastern Butana turn-off
cattle	23	268	62	122	28
sheep	31	783	243	333	103
goats	31	401	124	235	73
camels	7	608	43	381	27

Figures for projected turn-off rates are taken from Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Figures for population and turn-off numbers are in thousands of head.

Comparison of these figures with figures for the country as a whole reveals that, in addition to an increased contribution in absolute terms, there has also been an increase in relative terms, only slightly in the case of cattle, but more dramatically in relation to camels and goats, although there has been a slight fall in the case of sheep (Table 5.10).

In order to reach an estimate of this contribution in monetary terms it is necessary to utilise the eastern Butana's percentage contribution to national livestock turn-off in relation to total export earnings in livestock. Table 5.11 summarises the results of these calculations, giving a figure of LS 789,686 for export earnings from livestock in the eastern Butana. Total export earnings for 1974, which is the year to which the above figures refer, amount to LS 122,000,000 (12), so that the contribution of the eastern Butana represents a proportion of 0.64 per cent of the total. This figure is a little lower than the proportion obtained for 1965 of 0.80 per cent, but this decline must be seen in the context of the overall decline of livestock's contribution to export earnings. Thus, in 1965 livestock - through the export of animals - accounted for a total of 3,808,219 Sudanese pounds out of total export earnings of LS 67,138,552, which represents a proportion of 5.67 per cent, whereas in 1974 the respective figures were LS 5,879,800 out of LS 122,000,000, giving a proportion of 4.82 per cent.

It must be remembered, however, in both the situation prior to the establishment of the scheme and the present situation, that the estimates of the area's contribution to the national economy through livestock takes into account only earnings accruing from the sale of actual animals, and does not include earnings from the sale of processed meat or hides and skins,

(12) Democratic Republic of the Sudan (b), Bank of Sudan, Fifteenth Annual Report for the Year Ending 31st December 1974, Khartoum 1975 p. 18.

Table 5.10. Estimates of livestock turn-off in the Sudan and the eastern Butana. 1976.

	Sudan				eastern Butana.	
animal	rate of livestock pop'n increase 1956-1966	projected livestock pop'n 1976	projected livestock turn-off 1976	projected livestock turn-ff 1976(nos)	estimated turn-off	per cent of Sudan turn-off
cattle	31.59	11,977	6.3	755	28	3.71
sheep	24.50	10,782	25.6	2,760	103	3.73
goats	15.35	6,676	5.5	367	73	19.89
camels	41.85	2,837	3.6	102	27	26.47

Figures for livestock numbers are in thousands of head.

Figures for rates of turn-off are in percentages.

Figures for the Sudan are estimated from figures contained in Sir A.Gibb and partners. Kassala Province Survey. London. 1968.

Figures for the eastern Butana are estimated from figures contained in I.L.O. Report to the Government of the Sudan on the sedentarisation of nomadic tribal populations in the Butana region of Northern Sudan. Study Planning Mission. Nov 1963 - Feb 1964. ILO/TAP/Sudan/R.8. EPTA. Geneva. 1965

Table 5.11. Export earnings from livestock in the Sudan and the eastern Butana. 1974.

animal	export earnings Sudan (LS)	eastern Butana per cent contribution	eastern Butana export earnings(LS)
cattle	1,346,800	3.70	49,832
camels	1,395,000	26.47	369,256
sheep/goats	3,138,000	11.81	370,598
		total	789,686

Separate figures are not available for sheep and goat export earnings, so that the percentage contribution for the eastern Butana is averaged from the percentage contributions of the two animals.

Source: Democratic Republic of the Sudan(b). Bank of Sudan. 15th annual report for the year ending 31st December 1974. Khartoum. 1975.

as figures concerning this aspect of the area's contribution are unavailable. Therefore the proportional contribution of the area may in fact be a little higher than the estimates presented above would suggest. In addition, no estimate is possible of the value of the area's livestock to the domestic market, which is equally important, for it negates the necessity to import livestock and livestock products. In spite of these reservations, however, it is maintained that the foregoing analysis reveals that the scheme has not significantly reduced the area's relative importance in livestock production for the country as a whole.

5.2.4 The Contribution Of Agricultural Production On The Scheme To The Economy

Agriculture on the scheme, based upon the 3-course rotation of cotton, wheat and groundnuts, contributes to the national economy in 2 ways: cotton and groundnuts serve largely as cash crops, thereby earning foreign exchange, whereas wheat is essentially cultivated for domestic purposes, being intended as an import substitution crop. It is in this context that the central hypothesis of this section may be stated:

> That the introduction of agriculture through the scheme at Khashm el Girba has resulted in the area contributing significantly to the economy of the country.

To examine this hypothesis, each crop in the rotation will be dealt with separately.

a) Cotton. Since its inception, the scheme has gradually increased its relative importance in terms of the area under cotton cultivated throughout the country. The total area under cotton has, until recent projected reductions of the order of some 200,000 feddans (13), remained fairly steady, but the scheme's contribution has risen from less than 2 per cent in the mid-1960s to just under 10 per cent at the present (Table 5.12).

(13) M.E.E.D. 28th March 1975.

Table 5.12. Comparison of the area and production of cotton in the Sudan and at Khashm el Girba.

	area			production		
		Khashm el Girba	per cent		Khashm el Girba	per cent
year	Sudan	area	Sudan	Sudan	prod'n	Sudan
1964/65	1,067,573	15,365	1.44	3,259,000	53,777	1.65
1965/66	1,049,793	32,965	3.14	3,192,000	82,412	2.58
1966/67	1,158,361	53,375	4.61	3,842,000	192,150	5.00
1967/68	1,148,976	70,755	6.16	3,724,000	346,699	9.31
1968/69	1,168,000	91,605	7.84	4,630,000	428,711	9.26
1969/70	1,262,000	102,475	8.12	4,861,000	491,880	10.12
1970/71	1,213,000	107,385	8.85	5,082,000	485,380	9.55
1971/72	1,203,000	108,025	8.98	4,741,000	444,903	9.38
1972/73	1,182,000	109,220	9.24	3,997,000	231,285	5.79

Figures for area are in feddans.

Figures for production are in large kantars.

Figures for the Sudan come from Republic of the Sudan(a). Dept. of Agricultural Statistics. Bulletin of Agricultural Statistics. No. 10. 1969/70. Khartoum. 1970, and M.E.E.D.(b). 22.2.74.

Figures for Khashm el Girba come from the A.P.C. New Halfa.

In the case of production, however, a different picture emerges: although contributing only slightly at first, the scheme had achieved, by season 1967/68 a proportion of almost 10 per cent of total production, a figure which fluctuated only slightly until the 1972/73 season, when production declined from 444,963 large kantars the previous year to 231,285 large kantars, amounting to only 5.79 per cent of the country's total production. This exceptionally low figure was due to low yields, averaging only 2.62 large kantars per feddan - this was attributed, by the local authorities, to an unusually severe attack from disease (14). If the scheme's proportional contribution to total production in the country is applied to the country's total export earnings from cotton, an estimate can be reached of the scheme's actual monetary contribution to export earnings. Table 5.13 shows this contribution to be considerable, amounting to over LS 4,000,000 per annum, and in recent years, with the exception of season 1972/73, to over LS 6,000,000. These estimates do approximate closely to actual figures of gross revenue received by the A.P.C. (Table 5.14), although falling below the projected gross return expected from cotton, fixed at LS 6,800,000 (15).

b) Groundnuts. The importance of groundnuts as export earners has increased dramatically in recent years, it becoming the country's second most important export by value, after cotton, but, as has been demonstrated earlier (16), groundnuts were unpopular at Khashm el Girba during its early years, and are still not cultivated throughout the scheme, with the effect that the scheme's contribution to groundnut cultivation in the country as a whole has not been as great as its contribution to cotton cultivation.

(14) Personal communication: A.P.C. New Halfa.

(15) R. F. Wynn "Water Resource Planning: An Economic Problem". In D. J. Shaw (ed) op. cit. p. 107.

(16) See page 97.

Table 5.13. Contribution of Khashm el Girba to export earnings from cotton in the Sudan.

year	Sudan cotton export earnings	Khashm el Girba percentage contribution to production	Khashm el Girba financial contribution to export earnings
1965	35,655	1.65	588.3
1966	40,873	2.58	1,054.5
1967	44,426	5.00	2,221.3
1968	52,383	9.31	4,876.9
1969	52,837	9.26	4,892.7
1970	63,671	10.12	6,443.5
1971	69,816	9.55	6,667.4
1972	72,835	9.38	6,831.9
1973	84,311	5.79	4,881.6

Figures for export earnings are in IS 000s.

Figures for the Sudan for 1965-1968 are taken from Republic of the Sudan(g). Annual Foreign Trade Statistics. 1965-1969. Khartoum. various years.

Figures for the Sudan for 1970-1973 are taken from Democratic Republic of the Sudan(a). Bank of Sudan. 14th annual report for the year ending 31st December 1973. Khartoum. 1974.

Table 5.14. Gross revenue from cotton production at Khashm el Girba for selected years.

year	gross revenue
1965/66	1,017,430.530
1968/69	4,727,200.105
1969/70	5,549,019.504
1970/71	5,654,591.829
1972/73	4,468,293.875

Figures are in Sudanese pounds.

Source: A.P.C. New Halfa.

Indeed, the area of groundnuts cultivated on Khashm el Girba has constituted at its greatest extent only just over 3 per cent of the total area throughout the Sudan (Table 5.15). Similarly, production on the scheme, although variable, has not attained 6 per cent of the total production throughout the country, and more regularly attains between 1.5 per cent and 4 per cent of the total (Table 5.15). Nevertheless, estimated export earnings from groundnuts on the scheme have steadily increased, and in recent years have done so dramatically, reaching a peak of LS 747,000 in the 1972/73 season, (Table 5.16). In the early years of the scheme, however, corresponding to the unpopularity of the crop amongst the tenants, earnings amounted to well under LS 100,000. Even the highest figure obtained fails to meet up to the projected gross returns from groundnut cultivation of LS 1,100,000 (17), which estimate was based upon the assumption of a total cultivated area of 105,000 feddans, a figure which has not yet been attained.

c) Wheat. As wheat is cultivated almost exclusively for the domestic market and does not enter into the export market, it is difficult to assess the scheme's contribution through wheat production to the economy of the country in monetary terms. However, figures relating to production and area cultivated reveal that Khashm el Girba has consistently been one of the country's main producers of wheat (Table 5.17), continually accounting for over 25 per cent of both area cultivated and actual production. Estimates have been attempted on the gross return from the production of 105,000 feddans, the proposed area under wheat cultivation, and a figure of LS 1,300,000 reached (18).

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(17) R. F. Wynn op. cit. p. 107.

(18) Ibid. p. 107.

Table 5.15. Comparison of the area and production of groundnuts in the Sudan and at Khashm el Girba.

	area			production		
		Khashm el Girba			Khashm el Girba	
year	Sudan	area	per cent Sudan	Sudan	prod'n	per cent Sudan
1964/65	779	0.7	0.09	280,000	450	0.16
1965/66	974	2.0	0.21	304,000	600	0.20
1966/67	926	5.7	0.62	314,000	4,270	1.36
1967/68	855	4.5	0.53	291,000	4,296	1.48
1968/69	782	2.3	0.29	197,000	1,665	0.85
1969/70	1,083	34.5	3.19	408,000	11,746	2.88
1970/71	903	26.5	2.93	351,000	11,150	3.18
1971/72	1,527	12.9	0.84	384,000	6,881	1.79
1972/73	1,558	40.0	2.57	487,000	28,000	5.75
1973/74	1,870	45.4	2.43	572,000	22,637.5	3.96

Figures for area are in thousands of feddans.

Figures for production are in tons.

Sources: for the Sudan figures come from Democratic Republic of the Sudan(b). Bank of Sudan. 15th annual report for the year ending 31st December 1974. Khartoum. 1975.

for Khashm el Girba figures come from the A.P.C. New Halfa.

Table 5.16. Contribution of Khashm el Girba to export earnings from groundnuts in the Sudan.

year	Sudan groundnut export earnings	Khashm el Girba percentage contribution to production	Khashm el Girba financial contribution to export earnings
1965	8,586	0.16	13.7
1966	7,255	0.20	14.5
1967	6,514	1.36	88.6
1968	4,598	1.48	68.0
1969	5,022	0.54	27.1
1970	5,514	2.88	158.8
1971	9,327	3.18	296.6
1972	9,714	1.79	173.9
1973	12,993	5.75	747.1

Figures for export earnings are in LS 000s.

Figures for 1965-1969 are taken from Republic of the Sudan(g). Ministry of Finance. Annual Foreign Trade Statistics. 1965-1969. Khartoum. various years.

Figures for 1970-1973 are taken from Democratic Republic of the Sudan(a). Bank of Sudan. 14th annual report for the year ending 31st December 1973. Khartoum. 1974.

Table 5.17. Comparison of the area and production of wheat in the Sudan and at Khashm el Girba.

	area			production		
		Khashm el Girba			Khashm el Girba	
year	Sudan	area	per cent Sudan	Sudan	prod'n	per cent Sudan
1964/65	135	32.5	24.07	56	14.6	26.07
1965/66	136	35.5	26.10	69	14.2	20.58
1966/67	173	58.9	34.05	78	44.2	56.67
1967/68	264	83.8	31.74	111	32.7	29.46
1968/69	296	105.1	35.51	152	50.4	33.16
1969/70	290	125.1	43.14	115	42.1	36.61
1970/71	294	111.3	37.86	135	66.8	49.48
1971/72	285	117.6	41.26	156	49.5	31.73
1972/73	241	62.6	25.98	149	37.6	25.23
1973/74	420	120.6	28.71	274	72.4	26.42

Figures for area are in thousands of feddans.

Figures for production are in thousands of tons.

Sources: for the Sudan figures come from Democratic Republic of the Sudan(b). Bank of Sudan. 15th annual report for the year ending 31st December 1974. Khartoum. 1975.

for Khashm el Girba figures come from the A.P.C. New Halfa.

5.2.5 Summary

Overall gross returns from agricultural production on the scheme can be estimated as follows: assuming that groundnuts is now reaching a realistic level of return, an annual figure of LS 750,000 can be assumed. For cotton, averaging the gross returns since 1967/68 season when the area under cotton first reached over 100,000 feddans, a figure of LS 5,100,000 is obtained. Add to this the estimated returns from wheat cultivation of LS 1,300,000, and a total gross return of LS 7,150,000 is reached. However, these figures have of necessity referred to the scheme as a whole, to the extent that Nubian as well as local Arab tenants were included. To attempt a closer estimation of the specific contribution of the formerly nomadic element of the population, the figure of LS 7,150,000 was subjected to calculations based on the formerly nomadic tenants' proportion of the total number of tenants on the scheme, which stands at 72.7 per cent (16,000 out of 22,000), which gives an average gross revenue from the nomadic element of the scheme of some LS 5,200,000 per annum. Of this figure export earnings constitute some LS 4,300,000 (the ex-nomadic share of the wheat returns is estimated at LS 900,000). Table 5.18 shows the monetary and proportional contribution of the formerly nomadic element of the population on the scheme to total export earnings for the country, revealing it to contribute approximately 4 per cent of the total. Therefore the scheme has, through its expansion of national agricultural production effected a significant contribution to the economy of the country, not merely through its contribution to exports, but also by increasing the domestic supply of wheat.

Export earnings from livestock by nomads in the area now occupied by the scheme amounted to over LS 500,000. The introduction of the scheme into the area has not greatly reduced the contribution of livestock from the area, the actual earnings from livestock now amounting to over LS 700,000, which is above the pre-scheme figure in actual terms, but in

Table 5.18. Contribution of the former nomadic tenants at Khashm el Girba to export earnings for the Sudan.

year	Sudan	Khashm el Girba	adjusted export earnings from former nomadic tenants	per cent contribution to total export earnings of former nomadic tenants
1968	85,146	4,945	3,595	4.22
1969	86,251	4,920	3,577	4.15
1970	103,914	6,603	4,800	4.62
1971	114,374	6,963	5,063	4.43
1972	124,351	7,006	5,093	4.10
1973	152,200	5,628	4,091	2.69

Figures for export earnings are in LS 000s.

Figures for the Sudan are taken from Democratic Republic of the Sudan(a). Bank of Sudan. 14th annual report for the year ending 31st December 1973. Khartoum. 1974, and M.E.E.D.(b). 22.2.74.

relation to total export earnings constitutes a lower proportion. However, through the cultivation of groundnuts, and more particularly cotton, the overall contribution of the area to export earnings has greatly increased, now amounting to about LS 5,000,000 if estimated earnings from livestock are also included. In addition the area also supplies the local needs for livestock and livestock products, as well as contributing significantly to wheat production, as part of the country's import substitution policy. Therefore, the settlement of nomads on the scheme at Khashm el Girba has brought about their greater integration into the national economy, to the extent that their contribution to both export earnings and domestic supplies have increased significantly, and the presence of the scheme has not seriously diminished the importance of the area as a livestock producer. As already intimated, this may be a function of the settlers adaptations to the introduction of the scheme, rather than an occurrence which was planned for, especially as livestock are not incorporated into the scheme on a commercial basis. This point will be elaborated on further in the concluding chapter.

5.3 Returns From The Scheme In Relation To Investment

5.3.1 Introduction

While it has been shown that the scheme has led to the greater integration of the formerly nomadic population of the area into the country's economy, it remains to examine whether the economic returns from the scheme have justified the expenditures and investment which the scheme required initially, and still does to some extent need, so that net returns rather than gross returns must be considered. To this end the following hypothesis was established:

> That the investment which was involved in the settlement of nomads at Khashm el Girba has been justified and repaid by the returns which have accrued to the government of the Sudan from agricultural production on the scheme.

In examining this hypothesis it must be remembered that the scheme also contains Nubians displaced from the Wadi Halfa region, and for whom the scheme was originally intended, and, further, that because the settlement was necessitated by the flooding caused by the Aswan High Dam, Egypt helped towards the costs of the resettlement programme. Furthermore, any costs incurred from the resettlement process, as opposed to the construction and development of the scheme (ie the construction of the dam and canals) should be discounted from this analysis. The examination of the hypothesis will fall into 3 parts: the costs of investment; the annual returns on this investment; and a comparison of the scheme's performance with that of other schemes in the Sudan.

5.3.2 Costs Of Investment

Estimates as to costs of investment into the scheme have varied, although not to any considerable extent. One source gives a total government expenditure of LS 59.3 million, which is divided into LS 31.5 million for dam construction and irrigation installations, while the remainder includes the costs of resettlement (19). Another puts investment in dam construction and irrigation installations at approximately LS 30 million, which corresponds closely with the first figure (20), while total resettlement costs have been more accurately put at LS 25,995,686 (21). Therefore the figure which must be dealt with is the estimate of LS 31.5 million, which includes all irrigation installations and the preparation of the land.

(19) M. Y. Sukhar and M. H. el Jack "Mass Resettlement of the Population of the Lands Flooded by the Aswan High Dam: A Socio-Economic Appraisal of the Resettlement of the People of Wadi Halfa at Khashm el Girba Agricultural Scheme". In Papers presented to the National Conference on 'Human Environment and Development' held on 5-12 February 1972 Khartoum p. 24.

(20) R. F. Wynn op. cit. p. 110.

(21) H. Dafalla "The Nubian Exodus", London 1975 p. 272.

Of this amount the dam itself cost LS 11 million.

> "The original estimate was for LS 7 million, but owing to additional constructional works and other unforeseen circumstances it rose to LS 11 million". (22)

However, from the figure of LS 31.5 million should be deducted the cost of land preparation for the first Phase of the scheme, which was restricted to the resettlement of the Nubian population. This has been estimated at LS 6,609,308 (23). This reduces the original investment in settling the nomads to approximately LS 25 million, but since the scheme's completion expenditure in the development budget has continued, although on a greatly reduced scale. During the 5 Year Plan period 1970/71 to 1974/75 expenditure on the scheme was projected at LS 1,020,000 (24), the allocation of which is outlined in Table 5.19 for the 5 years of the plan. In addition the Plan also provided for an allocation of LS 40,000 for community development on the scheme, to be disbursed through the Ministry of Local Government (25). Adding these later expenditures to earlier investment, a total figure for investment in the settlement of nomads on the scheme of approximately LS 26 million is obtained.

5.3.3 Annual Returns

Gross annual returns from the scheme have been estimated at LS 7.1 million, but from this figure certain deductions need to be made, to take into account recurring annual costs, not included within investment

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(22) Ibid. p. 276. See also Appendix G.

(23) M. A. Ibrahim "Factors Affecting the Costing of Irrigation Schemes In the Sudan". In 'Engineering and Development in the Sudan' Vol. 2 Written Contributions, Procs. of the Fourteenth Ann. Conf. of the Phil. Soc. of Sudan, Khartoum 1966 p. 57.

(24) Democratic Republic of the Sudan (c), Ministry of Planning "Five Year Plan of Economic and Social Development of the Democratic Republic of the Sudan for the Period 1970/71 to 1974/75" Vol. 1 'Trends of Development' Khartoum 1970 p. 10.

(25) Ibid. 1973/74 'Development Budget' Khartoum 1973 p. 15.

Table 5.19. Expenditure on the scheme under the Five Year Plan. 1970/71 - 1974/75.

destination	total 5-year allocation	actual expenditure 1970-73	projected expenditure 1973-74	projected expenditure 1974-75
investigation into full mechanisation of cotton	120,000	14,107	10,250	-
mechanisation of production of groundnuts	500,000	115,000	145,000	147,000
buildings	400,000	223,921	105,850	300,000(1)
increasing the area and production of wheat(2)	-	-	-	124,000
	6			
total	1,020,000	353,028	261,100	571,000

Figures are in Sudanese pounds.

(1). This figure includes, apart from buildings, the construction of the Third Block.

(2). No provision for the extension of wheat was provided for in the original Budget estimates, and indeed was only introduced during the 1974/75 Budget.

Figures come from Democratic Republic of the Sudan. Ministry of Planning. Five Year Plan of Economic and Social Development of the Democratic Republic of the Sudan for the period 1970/71 - 1974/75. Development Budgets. 1970/71 to 1974/75. Khartoum. various years.

costs. These costs can be divided into 3: annual government expenditure which has been estimated at LS 1 million per annum of which LS 0.40 million goes to the Ministry of Irrigation, LS 0.45 million to the Ministry of Agriculture, and LS 0.15 million to Government services (26); the amortisation of development capital calculated over a 50-year period at 5 per cent which amounts to LS 1.6 million per annum (27); and overall production costs for the crops, which have been set at about LS 3 million per annum (28). This gives annual costs totalling LS 5.6 million which leaves a net return on investment of LS 1.5 million per annum. The estimated nomadic contribution to this figure is LS 1.1 million, so that since 1966/67 season when the settlement of nomads began to take place on a large scale on the scheme, return on investment had amounted to approximately LS 8 million by season 1974/75. Although, therefore, the original investment in settling nomads has not yet been repaid, the scheme as a whole, and the ex-nomadic proportion of the population of the scheme in particular, are essentially revenue producing, although perhaps not to the extent suggested by Dafalla:

> ". . . . . the project is essentially revenue producing, besides the income enjoyed by the tenants from their agricultural crops, in contributing LS 6 million annually to the public treasury". (29)

5.3.4 Comparison Of The Performance Of Khashm El Girba With Other Schemes In The Sudan

In conclusion it is felt that the scheme at Khashm el Girba should not be examined purely in isolation, and to this end it is now intended to briefly compare its economic performance with that of other agricultural schemes in the country. To achieve an effective comparison it is necessary

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(26) R. F. Wynn op. cit. p. 108.

(27) Ibid. p. 110.

(28) Ibid. p. 108.

(29) H. Dafalla op. cit. p. 275.

to examine figures relating to net returns per feddan cultivated, as the size of schemes throughout the Sudan varies considerably. Thus, at Khashm el Girba the net return has been estimated at LS 1.5 million over a cultivated area of about 255,000 feddans, which gives a net return per feddan of LS 5.9. In comparison, net returns at Managil have been estimated at LS 6.0, a slightly higher figure, although the same source gives the estimate for Khashm el Girba higher, standing at LS 7.6 (30). For the Gezira the figure for gross return was LS 3.67 in 1962/63 (31), and for 9 government schemes in Northern Province a mere LS 0.47 (32), while the return per feddan in the Gash Delta has been estimated at LS 2.35 (33). From the foregoing figures returns from the scheme at Khashm el Girba come out very favourably in comparison with returns from other agricultural schemes in the country, and it is worthwhile noting that, at present, groundnuts are not cultivated to their full capacity, and in view of the high returns per feddan obtained from this crop, if the area were to be expanded over the coming years the net return per feddan for the scheme as a whole would probably increase.

5.4 Conclusion

In conclusion it can be stated that the settlement of nomads on the scheme has effected their greater integration into and contribution to the national economy, while at the same time the government is obtaining a

(30) R. F. Wynn op. cit. p. 107.

(31) D. J. Shaw "The Development and Contribution of Irrigated Agriculture in the Sudan". In D. J. Shaw (ed) op. cit. p. 209.

(32) D. S. Thornton "Regional Development in the Case of the Northern Province". In D. J. Shaw (ed) op. cit. p. 39.

(33) T. H. Ahmed "Economic Aspects of Production in the Gash Scheme, Eastern Sudan". In D. J. Shaw (ed) op. cit. p. 292.

The figure is the average of net return from cotton, castor and dura.

return on its original investment. This is an important point, for the lack of any revenue can be a serious problem for any scheme's development, as Chambers has noted of the Mwea Scheme in Kenya:

> "Without any prospect of substantial revenue in its early years the Scheme was dependent on continued financial support, not only for extension but for its very survival". (34)

Thus Khashm el Girba is favourably placed for continued investment. Finally its performance in comparison to other agricultural schemes in the Sudan is impressive, closely corresponding to the performances of the Gezira and its Managil Extension.

(34) R. J. Chambers (a) op. cit. p. 65.

CHAPTER SIX

ECONOMIC ASPECTS OF THE SETTLEMENT (2)

6.1 Introduction

The general performance of the scheme has been analysed in the previous chapter, but the basis of this performance is the performances of the tenants themselves, and these are very much a function of the settlers reactions to a new environment. It is the purpose of this chapter to analyse these reactions and to examine the economic aspects of the scheme from the point of view of the settler. In this respect several points emerge: first, distinction must be made between those people settling on the scheme as tenants, and those who are not tenants; second, it is necessary to examine the effectiveness of cultivation on the scheme as an economic base for the tenants; third, it is important to ascertain the extent to which the settlers have left behind their former existence based upon pastoralism; and finally, an examination of the economic structure of the society on the scheme is desirable.

It is intended to show that each of these aspects are related, and consequently the following hypothesis was established to cover the overall scope of the present chapter:

> The settlement of nomadic peoples on the agricultural scheme at Khashm el Girba has provided the settlers with a sound economic base, founded upon sedentary cultivation within the scheme, and has led to a loosening of ties with their former existence, based upon the herding of livestock.

This hypothesis will be examined in 4 sections:

a) The agricultural production system of the scheme as a basis for an economic existence.

b) Alternative sources of livelihood within the scheme.

c) The continued connection of the formerly nomadic inhabitants of the scheme with their former existence, examined largely through the role of livestock.

d) The economic structure which has developed within the society of the formerly nomadic settlers on the scheme.

6.2 The Agricultural Production System

6.2.1 Introduction

The agricultural production system on the scheme is based upon a 3-course rotation of cotton, wheat and groundnuts, which has been outlined earlier (1), as have the tenancy arrangements under which production operates (2). It is the purpose of this section to examine how agricultural production on the scheme, based upon the 3 course rotation and operating under the existing tenancy arrangements, provides an economic base by which the settlers on the scheme can live. With this in view the following hypothesis was formulated:

> The system of agricultural production on the scheme, in the form of the rotation, yields an adequate income for the tenant, upon which he is able to live.

The examination of this hypothesis will inevitably focus upon the 3 crops of the rotation.

As with the majority of agricultural schemes in the Sudan, the scheme at Khashm el Girba was intended to effect a complete changeover from the traditional way of life of the inhabitants, based largely on a pastoral existence, to a settled life, based more or less exclusively on a cash-oriented crop production system. For such a complete changeover to take place, the new alternative must be able to provide a realistic existence in economic terms, for it is ultimately in economic terms that the settler

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(1) See pages 95-97.

(2) See pages 92-95.

will evaluate whether the new existence is superior to the former one, and therefore worthy of his full attention. It is intended in this section to examine whether the rotation on the scheme has achieved this aim, and to analyse the factors which have affected its ability to do so. To achieve this each crop will first of all be dealt with separately, before an overall assessment is attempted. The rationale for this approach is that the tenants' approach to and results from the rotation vary according to the crop with which they are dealing.

6.2.2 Cotton

Since the early days of the Anglo-Egyptian Condominium, cotton has been the main crop of the Sudan, being its chief export and major foreign exchange earner (3). In view of this, it is hardly surprising that, with every new development or extension in the agricultural sector, cotton figures high on the list of priorities. Thus, almost without exception (4), agricultural schemes within the country include cotton as a major part of their rotation. In this respect the scheme at Khashm el Girba is no exception, and in view of the crop's value to the country as a foreign exchange earner the extent of government control over the production of the crop is extremely extensive. At Khashm el Girba this control is under the responsibility of the Agricultural Production Corporation (A.P.C.), to the extent that the tenant is responsible only for the tending of the crop during its growing season (from August to January, February or March), and its eventual harvesting. Thus, the A.P.C. takes part in the preparation of the land, the sowing of the seed, the provision of the fertilisers, the spraying of the

(3) See page 95.

(4) The only scheme where cotton is not grown is on the Gash Delta near Kassala, where the crop was gradually phased out during the 1960s to be replaced by castor. See for further details A. R. Hassan Ahmed "Castor in the Economy of the Gash Delta", Gash Delta Agricultural Corporation, Khartoum 1969.

crop against pests, and all aspects of its processing, transportation and marketing. The tenant is obliged to yield his crop to the Corporation, an operation which is in marked contrast to the marketing practices of wheat and groundnuts, where the tenant is at liberty to dispose of the crops as he wishes. In the cultivation of cotton, therefore, the tenant acts more as a hired producer for the government than as a farmer.

An individual tenant's income from the cotton crop is dependent upon 3 main factors: the yield he obtains from his 5-feddan plot; the state of his individual account with the A.P.C. (5); and the variation in the world price of cotton. Of these factors, the most readily influenced by the tenant himself is the yield he obtains from his crop. The variation in yields obtained by tenants is large, as is reflected in Table 6.1, which shows not only large variations from village to village but also large variations within villages, as is demonstrated by the figures for standard deviation and upper and lower quartiles. The factors influencing these variations must be different from those influencing the variations observed from season to season (Table 6.2). This second type of variation is due to more generally occurring phenomena. Thus, in season 1967/68 the highest average yield for the scheme was achieved, at 4.9 large kantars per feddan: this was attributed to a decline in the attacks from pests, notably the spiny bollworm and certain aphids, but also because good rains in the early part of the season enabled less irrigation water to be used at that stage, thereby conserving it for use later in the season, when it might otherwise have been short (6). In the season 1972/73, however, the lowest average yield for the scheme as a whole of 2.11 large kantars per feddan was

(5) See Appendix C.

(6) Khashm el Girba A.P.C. (a) "Agricultural Production in Season 1967/68" New Halfa p. 1.

Table 6.1. Variations in cotton yields for six selected villages on the scheme.

village	mean	standard deviation	median	quartiles upper	quartiles lower
Wad Nabar	3.65	0.83	3.40	4.20	2.80
Umrahau	4.00	1.51	4.00	5.10	3.00
New Geili	2.93	1.32	3.00	4.00	2.00
New Reira	3.68	1.38	4.00	4.40	2.50
New Baraysi	5.37	1.01	5.60	6.00	4.40
Arrida Shukriya	2.87	1.32	2.80	4.00	1.70
overall	3.76	1.49	4.00	4.60	2.80

All figures are in large kantars per feddan.

Source: Author's questionnaire survey.

Table 6.2. Area, production and yield of cotton on the scheme. 1964/65 - 1973/74.

year	area	production	yield
1964/65	15,365	53,777	3.50
1965/66	32,965	82,412	2.50
1966/67	53,375	192,150	3.60
1967/68	70,755	346,699	4.90
1968/69	91,605	428,711	4.68
1969/70	102,475	491,880	4.80
1970/71	107,385	485,380	4.52
1971/72	108,025	444,903	4.12
1972/73	109,220	231,285	2.11
1973/74	109,535	424,590	3.88

Figures for area are in feddans, for production in large kantars, and for yield in large kantars per feddan.

Source: A.P.C. New Halfa.

recorded, and this was due to a severe attack of disease: wilt and black arm (7). Such variation is not, however, unique to the scheme at Khashm el Girba:

> "One of the main and most puzzling problems of cotton cultivation in the Gezira, is that of the violent fluctuations in yield between seasons. The causes of this are not easy to understand in a crop grown under fairly uniform climatic conditions and, because irrigated, not dependent on seasonal changes in rainfall. (Influences) . . . . . cover a wide range from incidence of pests and diseases, to effect of pre-sowing, postsowing and previous years rains, as well as the cropping history of the cultivated area with its effect on nutrient depletion, soil micro-organisms and the locking up of nitrogen and other nutrients in plant remains. None of these has been found adequate to explain the full extent of yield fluctuations. No doubt all might be involved and their relative importance change with circumstances". (8)

Many possible factors may, therefore, be responsible for yield variations at this level, but perhaps the most interesting, and disturbing, feature to emerge from Table 6.2 is the general decline in yields which appears to have taken place since the late 1960s. Indeed, throughout the scheme's history average yields have been below the expected figure of between 5 and 6 large kantars per feddan, and well below the figures achieved on the research farm, which have reached as much as 7.9 large kantars per feddan (9).

However, it is the individual variations in yield obtained by tenants, which are of importance to the individual variations in income from cotton experienced. To establish a measure of this relationship the following null hypothesis was established:

> There is no direct relationship between the yield of cotton obtained by a tenant and the income a tenant receives from his cotton crop.

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(7) Personal communication: A.P.C. Khartoum.

(8) N. R. Fadda and A. Y. Kordofani "Prospects of Cotton Production in the Republic of the Sudan", reprinted from 'Studies of Factors Affecting Yield' Doc. II XX (revised), International Cotton Advisory Committee, Washington 1961 p. 262.

(9) Republic of the Sudan (b) Ministry of Agriculture, Department of Agriculture, Khashm el Girba Scheme "Short Notes on Khashm el Girba Agricultural Project" 29th July 1963 p. 2.

To test this hypothesis the coefficient of correlation at the 0.05 level of significance and regression analysis were used. A figure of plus 0.8987 was obtained for the correlation test, which when compared with the appropriate tables (see Appendix H) revealed that the null hypothesis should be rejected. The result of the regression analysis is presented in Figure 6.1 which confirms a strong positive relationship between cotton yield and cotton income.

Due to the uniformity of both climate and soils within the scheme area (10), the consistent variations in yield of cotton cannot be attributed to any significant extent to physical factors. However, these variations and the continued depressed levels of cotton yields have been largely blamed by administrators and officials on the tenants themselves:

> ". . . . . except for lack of water and plenty of weeds, the failure of the scheme is attributed wholly to the bad performance of the tenants". (11)

Interviews with officials undertaken by the author confirmed this general attitude, for where yields are low it is usually attributed to a tenant's unwillingness to cultivate, or even to his laziness. Motivation, must, therefore, be considered as being a possible influencing factor upon the variations in yields of cotton within the scheme, but these may also be influenced by the technical and economic ability of the tenant to cultivate the crop efficiently.

Neither of these influences is easily measurable, and, at best, only indications of individual attitudes and abilities can be attempted. Motivation is a particularly difficult factor to evaluate, but 2 factors may be used as an indication of a tenant's motivation: first, the date of

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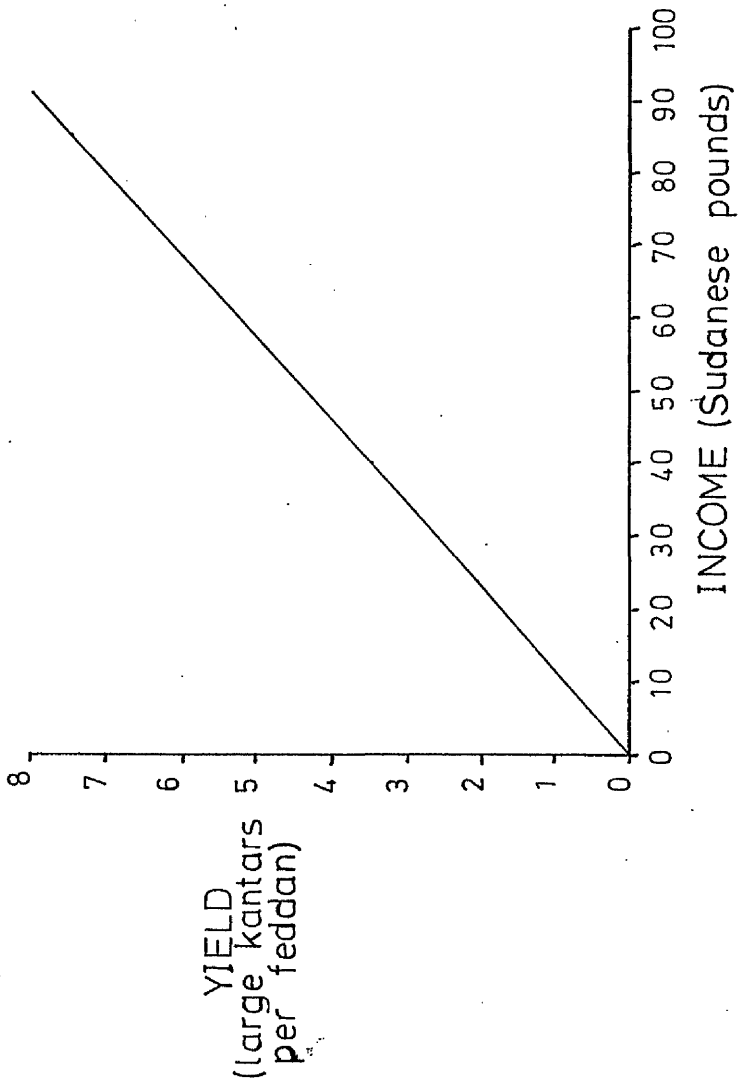
(10) See pages 73-77.

(11) G. Sorbo (b) "Economic Adaptations in Khashm el Girba", African Studies Seminar Series No. 14 Sudan Research Unit, Faculty of Arts, University of Khartoum, 1972 p. 7.

Figure 6.1. Regression analysis on cotton yield to cotton income.



harvest, for a late date of harvest may indicate a certain lack of interest in the cultivation of the crop; and second the amount of labour inputs - hired labour usage will be dealt with later, as the ability to hire labour is a function of a tenant's wealth. The inputs of family labour are, however, regarded as being more closely related to a tenant's attitudes to cultivation, for if a tenant and his family do not devote many hours towards the tending of the crop then their motivation cannot be very great. The nature of the data obtained through the questionnaire survey precluded the use of parametric statistical techniques, so that recourse had to be made to non-parametric techniques. Thus, in relation to the date of harvest, the following null hypothesis was established:

> The yield of cotton obtained by a tenant does not vary significantly according to the date of harvest of the crop.

This was tested by means of the Chi-square statistic, and a figure of 37.47 obtained for Chi-squared. With 21 degrees of freedom and a level of significance of 0.05 the null hypothesis had to be rejected (see Appendix I), which suggests that a significant relationship between date of harvest and cotton yield does exist. The date of sowing has already been mentioned as being a significant factor affecting cotton yields (12), the range of optimum sowing period extending from August to mid-September (13). Tenants almost invariably gave their time of sowing as August, therefore falling within the optimum period, but a much wider variation in date of harvesting was observed, ranging from as early as December to as late as March (Table 6.3). While the date of harvest may be a function of a tenant's attitude towards the crop, it may also be subject to the vagaries in decision-making that

(12) See page 96.

(13) Khashm el Girba A.P.C. "Sowing at Optimum Dates in Relation to Preplanting Operations and Irrigation" (no date, but internal evidence suggests 1971 or 1972), p. 4.

Table 6.3. The cultivation and yield of cotton measured in relation to the month of harvest.

month of harvest	percentage of tenants harvesting in that month	mean yield of harvests in that month
December	10.16	2.68
January	50.00	3.99
February	10.16	4.06
March	29.69	3.62

Figures for mean yield are in large kantars per feddan.

Source: Author's questionnaire survey.

must inevitably occur amongst tenants. The fact that the null hypothesis was rejected suggests, however, that it is a factor which should receive more attention from the authorities, with a view to discovering the optimum date or period for the harvesting of the crop, to add to the knowledge concerning sowing dates. Figures for mean yield obtained according to the month of harvest suggest that January and February would be the most favourable months for harvesting (Table 6.3), but this aspect requires more detailed analysis, before any firm conclusions can be drawn, and the nature of the data obtained through the questionnaire survey precludes such an analysis from the present discussion.

In terms of motivation, the date of harvest does not appear to be a particularly reliable indicator, but the utilisation of family labour might be more reliable. The average number of man-hours per day worked by members of the family was estimated at 13.4 man-hours per day. Tenants employing less than the average number of man-hours were attributed as low-motivation tenants, and those using above the average as high-motivation tenants. To see if there was any difference in the yields obtained by the designated high- and low-motivation tenants, the data was subjected to the Kolomogorov-Smirnov test for 2 independent variables. A one-tailed test was used as it was desired to discover whether the high-motivation tenants achieved higher yields than the low-motivation tenants. Consequently the following null and alternative hypotheses were established:

H_0 There is no significant difference between the yields obtained by low-motivation tenants and those obtained by high-motivation tenants.

H_1 High-motivation tenants obtained significantly higher yields than low-motivation tenants.

These hypotheses were tested at the 0.05 level of significance and a figure for Chi-squared of 0.78 obtained. Comparison of this figure with the Chi-square tables at 2 degrees of freedom (Appendix I) revealed that the null hypothesis should be accepted in favour of the alternative hypothesis, which

implies either that motivation measured by this means does not influence yields obtained, or that the utilisation of family labour inputs does not represent a satisfactory indicator of motivation. In neither case does the information allow for a definitive statement concerning the influence of motivation on yields, and the factor remains one which it is very difficult to measure, and which can, therefore, only be assessed qualitively. This will be attempted after examination of the influence of economic ability on yields.

Whereas motivation, as has been seen, is very difficult to measure quantitatively through indicators, it is possible to devise several indicators of economic ability. Such economic ability does not necessarily imply a motivation to cultivate cotton efficiently, but does mean that efficient cultivation is possible, whereas motivation without sufficient economic resources precludes efficient production. The possible indicators of such economic ability are numerous, and the following were selected for analysis: the ownership of livestock in the Butana; the availability of income from an alternative source; the cultivation of groundnuts; the use of hired labour; and the total income accruing to a tenant. Such factors as total income and the availability of an alternative source of income are self-explanatory as indicators of wealth, and therefore, of economic viability, which is necessary to allow the required inputs for efficient cultivation of cotton. The other indicators, however, require some little explanation: the ownership of livestock implies an ability to diversify economic interests which requires not inconsiderable economic resources, while the cultivation of groundnuts is an expensive operation, which is only possible for tenants with extensive resources. Similarly the utilisation of hired labour is also only possible if extensive resources are available. The data received was converted to the ordinal scale, and consequently suitable for analysis by the Kolmogorov-Smirnov test for 2 independent samples. As in all cases

it was desired to find the direction of any difference between the samples so the one-tailed test was used. For the analysis of hired labour tenants were divided into high- and low-labour users, according to whether they used more or less than the average number of man-hours per day used. Similarly for the analysis of total income tenants were divided into high- and low-income tenants depending upon whether their incomes were above or below the average for the whole. Such procedures were not necessary for the other factors to be tested, for they all contain an either/or element: for example a tenant either grows groundnuts or he does not. Thus, for each factor to be tested, a null hypothesis was set up alongside an alternative hypothesis, in the following manner:

a) The ownership of livestock in the Butana.

H_0 There is no significant difference between the yields obtained by those tenants owning livestock in the Butana, and those not owning livestock in the Butana.

H_1 The tenants owning livestock on the Butana obtain significantly higher yields than those who do not own livestock on the Butana.

b) An alternative source of income.

H_0 There is no significant difference between the yields obtained by those with an alternative source of income and those obtained by those who do not have an alternative source of income.

H_1 Those tenants with an alternative source of income obtain significantly higher yields than those who do not have an alternative source of income.

c) The cultivation of groundnuts.

H_0 There is no significant difference between the yields obtained by those tenants who cultivate groundnuts and those obtained by the tenants who do not cultivate groundnuts.

H_1 Those tenants who cultivate groundnuts obtain significantly higher yields than those who do not cultivate groundnuts.

d) The use of hired labour.

H_0 There is no significant difference between the yields of the tenants who are high users of hired labour and those of the tenants who are low users of hired labour.

H_1 The tenants who are high users of hired labour obtain significantly higher yields than those who are low users of hired labour.

e) Total income.

H_0 There is no significant difference between the yields of high-income tenants and those of low-income tenants.

H_1 High-income tenants obtain significantly higher yields than do low-income tenants.

These hypotheses were tested at the 0.05 level of significance, and the results of the tests are presented in Table 6.4. In all cases except that of total income the null hypothesis was accepted in favour of the alternative hypothesis, so that the factors of cultivation of groundnuts, an alternative source of income, the ownership of livestock on the Butana, and the use of hired labour have no significant bearing on the yields of cotton obtained. As in the test on the relevence of the use of family labour to yields obtained, this may mean that yield obtained is not a function of the economic ability of a tenant, but in view of the rejection of the null hypothesis in favour of the alternative hypothesis in the case of total income it seems more likely that such factors are not adequate indicators of a tenant's economic ability to cultivate the crop efficiently. On the other hand, those tenants with higher than average incomes were seen to obtain significantly higher yields than those with below average incomes, which implies that there is some relationship between wealth and yield.

An attempt has been made to analyse the influence of motivation and economic ability on the yields of cotton obtained by tenants in statistical terms, but this analysis has not proved particularly conclusive, although some relationship has been shown to exist between a tenant's total income

Table 6.4. Results of the Kolmogorov-Smirnov test on indicators of the economic ability to cultivate cotton efficiently.

indicator tested	value of D	value of Chi-square	H_o accepted or rejected
ownership of livestock on the Butana	0.08	0.7280	accepted
an alternative source of income	0.15	2.8729	accepted
cultivation of groundnuts	0.17	3.4065	accepted
use of hired labour	0.19	4.6208	accepted
total income	0.30	11.3400	rejected

In this test the value obtained for Chi-square is compared with the relevent tables at 2 degrees of freedom. With df - 2, and a level of significance for H_o of 0.05, a value for Chi-square of greater than 5.991 is required for H_o to be rejected in favour of H_1. The relevent tables are presented in Appendix I.

and his cotton yields. Any generalisation with regard to these 2 factors is not only difficult, but also dangerous, as, especially in the case of motivation, it may very much be a case of personal vagaries in nature. Furthermore any lack of commitment to the cultivation of cotton may not necessarily extend to the other crops on the rotation. Observation and interviews of a general nature suggest that the officials' view that low yields may be largely attributed to laziness and a lack of motivation may not be completely groundless, but at the same time there is some evidence to suggest that economic factors may also restrict the yields of the crop obtained, for if a tenant is unable to hire labour to weed his land, and has insufficient labour in his own family to do the job efficiently, then inevitably yields are going to suffer. Both factors must, therefore, be taken into consideration in analysing the wide variations in yields obtained. The question of motivation requires further examination, however, for it is important to discover the reasons behind any lack of motivation towards the cotton crop. Two factors would appear to emerge as being particularly responsible for such an attitude: the lower incomes obtained from cotton than from the other crops in the rotation (Table 6.5); and the degree of control exerted by the government upon the cultivation of the crop, to the extent that the tenant is forced to sell his crop to the A.P.C., from which he receives any profits from the sale of the whole crop. But, as will be shown shortly, even the income a tenant receives for his cotton on the basis of the joint and individual accounts is sometimes a mystery. Thus, in the final analysis, even the human factor of motivation may be based on a rational economic argument. Therefore, for the authorities to lay the blame of poor yields on the tenants' laziness and motivation is a less than constructive attitude, for it makes no attempt to discover the motives behind the tenants' actions. While in some cases sheer laziness may be responsible, in others the lack of motivation may be backed by sound

Table 6.5. Mean incomes from the crops in the rotation for six selected villages on the scheme.

village	cotton	wheat	groundnuts	total
Wad Nabar	38.33	68.25	140.45	167.71
Umrahau	50.24	47.29	80.55	107.97
New Geili	33.23	71.57	102.33	120.50
New Reira	40.00	60.87	118.65	197.33
New Baraysi	56.00	73.38	174.72	283.39
Arrida Shukriya	35.29	62.07	183.54	196.10
overall	42.45	63.09	140.03	174.69

Figures are in Sudanese pounds.

Source: Author's questionnaire survey.

reasoning, while in others still, the question of motivation may not arise, because the achievement of good yields is precluded by economic factors.

These large variations in yield, whatever the causes, have been shown to be closely linked, as might be expected, to the final income obtained from cotton, which itself is highly variable (Table 6.6). But 2 other factors are also important, both of which are less under the control of the tenant himself. First, the nature of the relationship between the tenant and the A.P.C. in relation to profits from cotton, is organised on the basis of a 2-account system: the joint account and the individual account (14). Thus if a tenant borrows from the Corporation for any purpose - for example if he requires his wheat or groundnut crop to be sprayed against pests - the charge is debited against his individual account. Thus, any service the Corporation provides for the tenant which is not related to the cultivation of the crop is treated on a loan basis, and the costs of such services are deducted from the tenants' profits from his cotton crop at the end of each season. However, it has been reported that the debts incurred under such loans were not pressed by the Corporation, but were placed under 'suspended accounts' (15). Other debits are also possible under the individual account (16), so that it is very difficult for a tenant to keep track of the standing of his cotton account with the A.P.C. throughout the year, and he may even finish the year in debt to the Corporation, as Sorbo has remarked of a Nubian tenant:

> "The A.P.C. just informs him that his tenancies this year have been running at a loss after deductions have been made on the joint account, and that he is indebted to the Corporation". (17)

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(14) See Appendix C.

(15) H. G. Blanckenburg "The Khashm el Girba Settlement Scheme in Sudan: An Appraisal for the World Food Programme", Institut fur Auslandische Landwirtschaft der Technischen Universitat, Berlin 1969 p. 38.

(16) See Appendix C.

(17) G. Sorbo (b) op. cit. p. 16.

Table 6.6. Variations in cotton income for six selected villages on the scheme.

village	mean(total)	standard deviation	mean(per feddan)
Wad Nabar	38.33	8.85	8.43
Umrahau	50.24	22.11	10.08
New Geili	33.23	15.63	7.67
New Reira	40.00	18.76	8.02
New Baraysi	56.00	10.25	10.61
Arrida Shukriya	35.29	19.71	7.06
overall	42.45	19.16	8.68

Figures are in Sudanese pounds.

Source: Author's questionnaire survey.

Thus, this factor can also affect individual variations in income from cotton, but the final, most unpredictable factor is the world market situation. The variations in the price of medium staple cotton are shown in Figure 6.2 and Table 6.7. Such variations affect all tenants uniformly in that they are incorporated in the joint account, as indeed are variations in the prices of fertilisers and spray (18). Having calculated all income and expenditure incurred under the joint account, the Corporation calculates a price per kantar to be paid to all tenants alike. This varies considerably very much as cotton prices vary, but is seen to be particularly variable when compared with gross revenue from cotton (Table 6.8). It is from the revenue to each tenant, calculated from this figure, that debts under the individual account are deducted.

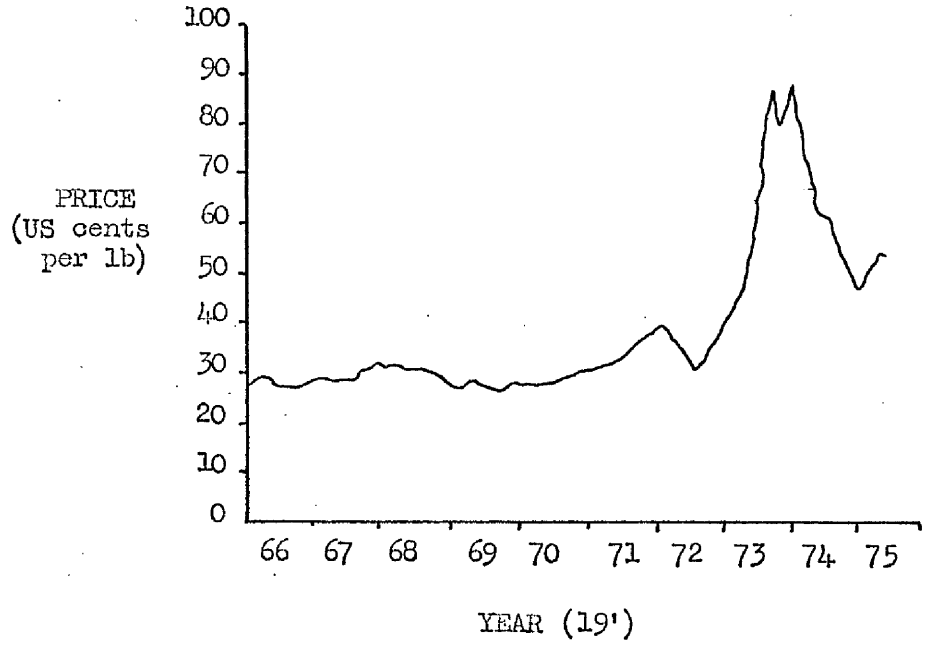
The levels of income received by tenants from the cotton crop varies enormously according to the 3 factors examined above, but yield has been shown to have a particularly strong influence upon this. Although attributed by the Authorities to tenants' attitudes to the crop, it has been shown that economic as well as human factors may act as constraints upon the ability of many tenants to achieve good yields. An assessment of the importance of income from the cotton crop to the tenant will be attempted later in this section when incomes from the other crops will also be taken into account.

6.2.3 Wheat

In many respects the position of the tenant in the cultivation of wheat is very dissimilar to his position in the cultivation of cotton. Wheat production is not subject to the same degree of control, but, more importantly to the tenant, the marketing of the crop is the sole responsibility of the tenant, and any profits therefrom are his and need not be divided between 2 partners. On the other hand tenants must cover any production

(18) See Appendix C.

Figure 6.2. Monthly variations in the world price of cotton. 1966 - 1975.



Figures are for cotton prices c.i.f. in N.Europe.

Source: Middle East Business Digest. Raw Cotton: economic life blood of Sudan. September. 1975. p. 15.

Table 6.7. Variations in the world price of cotton. 1955-1972.

year	I	II
1955	0.73	1.43
1956	0.63	1.60
1957	0.64	1.09
1958	0.58	0.78
1959	0.55	0.98
1960	0.60	1.03
1961	0.62	0.95
1962	0.60	0.91
1963	0.56	1.01
1964	0.57	1.15
1965	0.55	1.10
1966	0.53	1.13
1967	0.56	1.23
1968	0.54	1.38
1969	0.55	1.39
1970	0.63	1.35
1971	0.77	1.43
1972	0.78	1.61

Figures are in US dollars per kilogram.

I - Prices of American cotton c.i.f. Liverpool.

II - Prices of Egyptian cotton c.i.f. Liverpool.

Figures for 1955 - 1967 come from F.A.O. Production Yearbook. Vol. 25. 1971. New York. 1972.

Figures for 1968 - 1972 come from F.A.O. Production Yearbook. Vol. 27. 1973. New York. 1974.

1972/73
4,468,293.875
2,897,598.928
1,570,694.947
31,413.898
1,539,281.049
769,640.544
769,640.545
15,392.810
754,257.715
2.642

Table 6.8. Calculated cotton accounts for Khashm el Girba for selected years.

	1965/66	1968/69	1969/70	1970/71
revenue	1,017,430.530	4,727,200.105	5,549,019.504	5,654,591.829
expenditure	645,014.469	2,830,815.594	3,551,130.320	3,482,995.542
gross profit	372,415.061	1,896,384.511	1,997,989.184	2,171,596.287
2 per cent land fee(1)	-	-	39,957.783	43,431.925
net profit	-	-	1,957,931.401	2,128,164.362
A.P.C. share(2)	186,208.031	948,192.255	978,965.701	1,064,082.181
tenants' share(3)	178,759.751	948,192.255	978,965.700	1,064,082.181
2 per cent Special Fund(4)	7,448.321	18,963.845	19,579.313	21,281.644
revised tenants' share	-	929,229.411	959,386.387	1,042,800.537
price per kantar given to tenant	2.194	2.156	1.952	2.148

Figures are in Sudanese pounds.

(1). The 2 per cent land fee did not come into operation until 1969/70.

(2). Until 1969/70 the scheme was under the management of the government, which took 50 per cent of all profits.

(3). In 1965/66 the tenants' share of profits was only 40 per cent.

(4). The 2 per cent Special Fund deduction was taken out of net profits until 1968/69, after which time it was taken from the tenants' share.

Source: Accounts Section. A.P.C. New Halfa.

expenses, such as the provision of fertilisers and the use of mechanisation, themselves. However, a tenant does not pay for the supply of irrigation water to his wheat crop, or to his groundnuts (19), although this was not always the situation, for, at the scheme's inception, water rates were charged for wheat at LS 9.6 per feddan for 8 waterings (20), which amounted to a total cost for a 5-feddan plot of LS 48 per annum, a not insignificant amount when compared with total possible gross earnings from the crop.

As with cotton, income from the wheat crop is governed by yields obtained and the market price, the latter tending to be an influence generally, and the former being related to individual variations. To test the strength of the relationship between the yield of wheat and income from wheat, the data obtained through the questionnaire survey was subjected to statistical analysis and the following null hypothesis established:

> There is no significant direct relationship between the income received from the wheat crop and the yield of the wheat crop.

To test this hypothesis the coefficient of correlation was used at the 0.05 level of significance. A figure of plus 0.1379 was obtained, which when compared to the appropriate tables (Appendix H) revealed that the null hypothesis should be accepted. This contrasts with the correlation of cotton yields and income, where the null hypothesis was rejected. This phenomenon can be explained by the uses to which the wheat crop is put once harvested. Apart from being sold, much of the crop is retained either as seed for the following year or for domestic consumption to supplement the supply of dura (Table 6.9). At the present time, more of the crop appears to be sold than in the scheme's earlier years, when 70 per cent of the crop was reported as

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(19) G. el Din Sid Ahmed (a) "Marketing of Agricultural Products at Khashm el Girba", M.Sc. Thesis, Khartoum 1968 pp. 34-5.

(20) Ibid. p. 16.

Table 6.9. Sale of wheat crop in six selected villages on the scheme.

village	percentage of crop sold	percentage of tenants selling 100 per cent of crop
Wad Nabar	98.38	93.75
Umrahau	77.47	47.06
New Geili	81.16	78.26
New Reira	93.26	78.26
New Baraysi	82.78	66.67
Arrida Shukriya	75.25	42.11
overall	85.87	63.55

Source: Author's questionnaire survey.

sold, 18 per cent consumed and 12 per cent retained as seed (21). This may, in part, be due to the construction of a flour mill in New Halfa, which began production in 1971, and which has attempted to encourage the sale of local wheat in the scheme for its production purposes.

One aspect of wheat's performance and production which sets it apart from the other 2 crops on the scheme is the high rate of crop failure which affects it, running on average between 20 and 25 per cent in the 6 villages surveyed (Table 6.10). This can be largely attributed to the factor of water shortage, which consistently affects the wheat crop more severely than either of the other 2 crops. This is because groundnuts are sown and harvested earlier in the season and consequently get the benefits of the rains and do not therefore require such large amounts of irrigation water, while cotton, because of its pre-eminence on the scheme receives priority of water usage above both the other crops. One notable aspect to emerge from Table 6.10 is the relatively high proportion of failure in both villages surveyed along the eastern edge of the scheme by the River Atbara - Wad Nabar and Umrahau. To test this impression statistically the following null hypothesis was set up:

> There is no significant difference in the levels of failure of the wheat crop in those villages along the eastern edge of the scheme and those in other parts of the scheme.

This was tested by the Chi-squared statistic, using a level of significance of 0.05. A figure of 8.413 was obtained for Chi-squared, which at one degree of freedom and a 0.05 level of significance meant that the null hypothesis had to be rejected (Appendix I). Consequently, it can be inferred that the villages in the eastern part of the scheme suffer significantly more from failure of the wheat crop than villages in other parts of the scheme. This may be partially due to the nature of the canalisation system in this part

(21) Ibid. p. 73.

Table 6.10. Failure of wheat crop in six selected villages on the scheme.

village	percentage tenancies with total failures	percentage tenancies with partial failures	percentage area sown failed
Wad Nabar	23.81	61.90	45.24
Umrahau	35.71	50.00	45.36
New Geili	6.67	6.67	6.67
New Reira	4.17	4.17	4.17
New Baraysi	-	-	-
Arrida Shukriya	5.00	25.00	22.87
overall	14.29	28.57	22.83

Source: Author's questionnaire survey.

of the scheme, which is fed by the Eastern Branch Canal, and is less dense than in other parts of the scheme (Figure 6.3). A further factor may be the efficiency of water usage by the tenants. This was cited as a factor behind the recurrent water shortage problem throughout the scheme by many field officers, and was particularly emphasised by officials working in the eastern part of the scheme, where they blamed the phenomenon largely on the distances involved between many of the villages and the tenancies belonging to the inhabitants of those villages, which means that less time can be spent upon the upkeep and maintainance of the minor canals.

As the water shortage problem becomes particularly difficult later in the season, it was decided to examine whether early sowing significantly reduced the level of crop failure. To this end the following null hypothesis was established:

> There is no difference in the levels of crop failure in the months September, October, November and December.

This was subjected to the Chi-squared test, with a 0.05 level of significance and 3 degrees of freedom. A figure of 7.810 was obtained which meant that the null hypothesis had to be accepted (Appendix I), so that date of sowing has no significant effect upon the levels of crop failure.

In the case of cotton 2 main influences were cited as possible causes for the large variations in yields observed - motivation and economic ability. In the case of wheat, however, neither of these influences appears to act as such constraining factors. Since the beginning of the scheme, wheat has always been the most popular of the 3 crops in the rotation, which is demonstrated in the area devoted to the crop throughout the scheme's history, shown in Table 6.11, where, with the exception of season 1972/73 (22) the area under wheat has consistently exceeded the area under cotton

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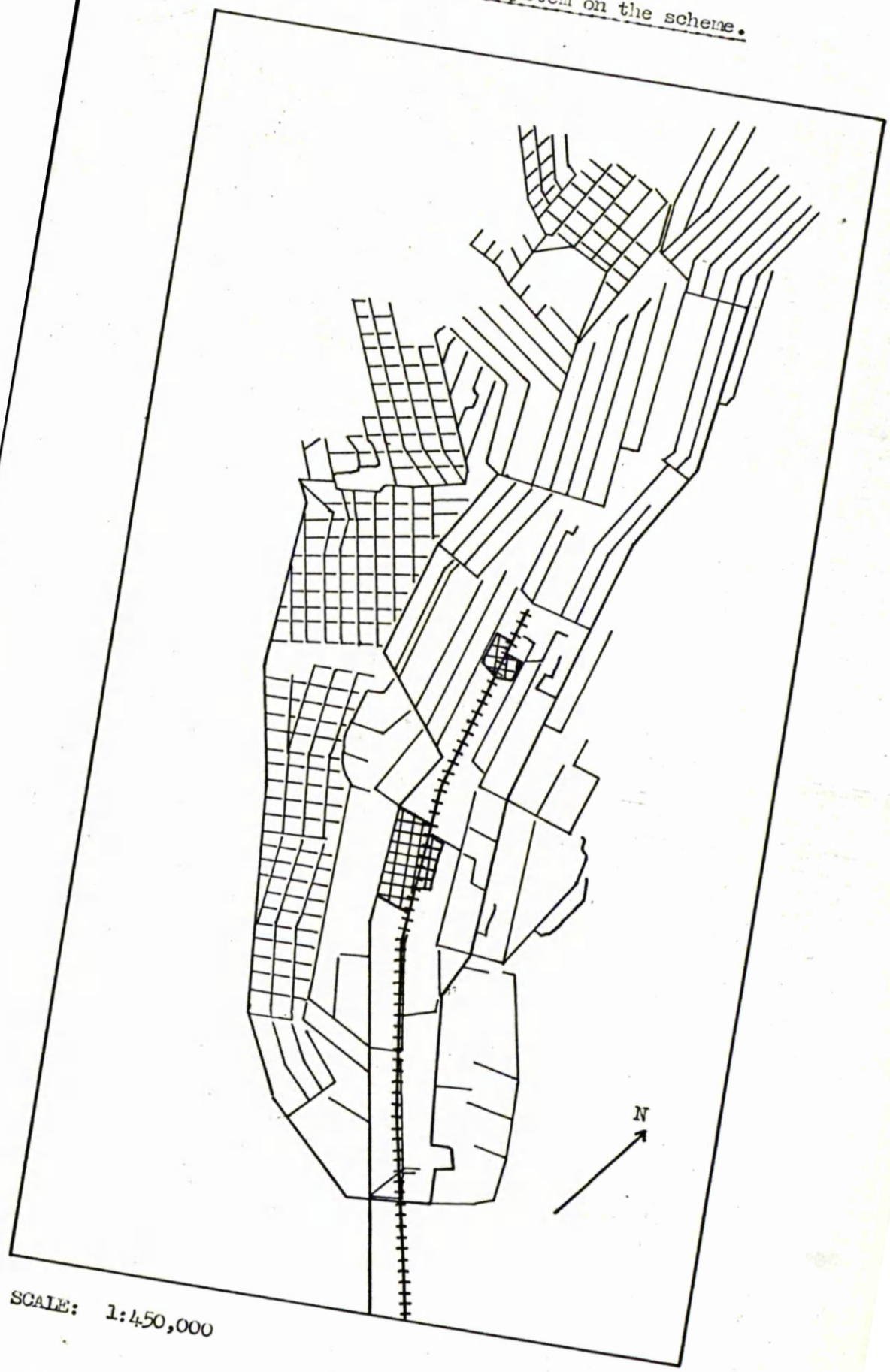
(22) See page 99.

Figure 6.3. The canalisation system on the scheme.



SCALE: 1:450,000

Table 6.11. Area, production and yield of wheat on the scheme. 1964/65 - 1973/74

year	area	production	yield
1964/65	32,500	14,625	0.45
1965/66	35,500	14,200	0.40
1966/67	58,875	44,156	0.75
1967/68	83,779	32,672	0.39
1968/69	105,061	56,429	0.48
1969/70	125,131	42,046	0.34
1970/71	111,280	66,768	0.60
1971/72	117,598	49,505	0.42
1972/73	62,600	32,560	0.60
1973/74	120,650	72,390	0.60

Figures for area are in feddans, for production in tons, and for yield in tons per feddan.

Source: A.P.C. New Halfa.

and far exceeded that under groundnuts (23). The main reasons for this popularity are its ease of cultivation - the only operation requiring manual labour being weeding - and the fact that the crop can be used for subsistence purposes as well as or instead of for sale, while at the same time, as will be shown later it is more remunerative than cotton. Consequently it can be assumed that the desire to cultivate the crop has always been high, and that the question of motivation does not, therefore, provide a constraint upon yields.

Similarly, not such high costs are involved in the crop's production, for most of the operations are done mechanically, for which the tenant receives some financial help, amounting to over half the total costs of mechanisation. This sort of direct help comes from the A.P.C. As wheat is the crop most affected by mechanisation, it is felt apposite, at this stage to briefly examine the provisions for the use of machinery on the scheme, and several of the points made here will also be applicable to the cultivation of groundnuts and cotton.

Mechanisation in the cultivation of wheat is used in all stages: from the preparation of the land, through the sowing of the seed to the eventual harvesting of the crop. The necessary machinery for these operations comes from 2 main sources - private entrepreneurs and co-operatives. Of the 2 the co-operatives are more widely used and receive backing from the government. Indeed, it was largely for this purpose that their creation was encouraged:

> "The main purpose of the co-operatives is the purchase and operation of farming machinery for mechanised wheat and groundnut production within the scheme, since - in accordance with the partnership agreements - both crops are grown by the farmers under their own management". (24)

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(23) For comparative figures see Tables 6.2 and 6.14.

(24) M. Bardeleben "The Co-Operative System in the Sudan" Afrika-Studien Nr. 82 Munich 1973 p. 63.

The co-operatives are backed in these functions by the Agricultural Bank in New Halfa. The utilisation of the co-operatives' machinery is not restricted to members of the co-operatives:

> "Most co-operatives make no distinction between members and non-members either with respect to precedence or to price quotations and terms of payment". (25)

It is with respect to terms of payment that co-operatives differ from private machinery owners, for the former do not give any credit facilities to the tenants, whereas the latter do provide such facilities (26). For the poorer tenants on the scheme such facilities are essential, in spite of the government aid which is provided (27), for they can only afford to pay for the hire of the machinery once they have received the profits from their wheat crop.

The only operation not possible by mechanical means in the cultivation of wheat is the weeding. In view of such low labour requirements it is to be expected that the extent of the use of labour would not show a significant relationship to the yield of wheat obtained. To examine this the following null hypothesis was established:

> There is no significant relationship between the yields obtained by those tenants with a high labour usage and those with a low labour usage.

High and low labour usage were determined by calculating the average number of man-hours worked per day by all people working on a tenancy: thus, tenants with a high labour usage were those whose labour usage exceeded the average, and vice-versa. As this hypothesis was to be tested by the Kólmogorov-Smirnov test for 2 independent samples, using a 2-tailed test an alternative hypothesis also had to be set up, which stated:

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(25) Ibid. p. 63.

(26) Ibid. p. 63.

(27) See page 212.

There is a significant difference between the yields obtained by those tenants with a high labour usage and those with a low labour usage.

These were tested at the 0.05 level of significance and a figure for D of 0.17 obtained. As this figure was less than the calculated figure for significant values of D - 0.26 - the null hypothesis had to be accepted in favour of the alternative hypothesis. Consequently, it can be stated that the level of labour inputs does not have a significant effect on the yield of wheat obtained.

In the cultivation of cotton it has been shown that the date of harvest had some influence on the level of yield obtained. To examine whether a similar influence obtained for wheat in relation not only to dates of harvest, but also to the date of sowing, the following null hypotheses were set up:

The date of sowing of the wheat crop does not affect significantly the yield obtained by the crop.

The date of harvesting of the wheat crop does not affect significantly the yield obtained by the crop.

Both these hypotheses were tested using the Chi-square statistic at the 0.05 level of significance. Figures for Chi-squared of 6.7669 and 20.0157 respectively were obtained. For date of sowing with 6 degrees of freedom the null hypothesis had to be accepted, as did the null hypothesis for the date of harvest with 12 degrees of freedom. Therefore, neither the date of sowing nor the date of harvesting appear to have any significant effect on the yield of wheat obtained. This is borne out when the mean yields of the crop are computed for the various dates of harvesting and sowing, particularly in the case of harvesting (Table 6.12).

Although yield is an obvious factor affecting income from the wheat crop, another important factor is the market situation. Unlike either cotton or groundnuts, wheat is solely for the country's domestic market, and its sale is confined to merchants and bodies on the scheme. Examination

Table 6.12. The cultivation and yield of wheat measured in relation to the months of sowing and harvesting.

month	percentage of tenants sowing	mean yield
September	2.80	1.93
October	29.91	2.41
November	67.29	2.91
	percentage of tenants harvesting	mean yield
February	5.61	2.87
March	38.32	2.81
April	56.07	2.68

Figures for mean yield are in sacks per feddan. One sack holds approximately one quarter of a ton.

Source: Author's questionnaire survey.

of wheat income during the 1973/74 season revealed that the crop fairly consistently fetched between LS 5 and LS 6 per sack, so that an average tenancy yielding 15 sacks could produce up to LS 90 from the wheat crop if all were sold. It is the function of the Agricultural Bank in New Halfa to ensure that the highest possible price for wheat is obtained by the tenants. To do this it provides the tenants with facilities for storing the crop until the market price reaches what it assumes to be an optimum level. The same situation obtains for the marketing of the groundnut crop (28). Due to this mechanism, and the fact that the tenants do not have to share their profits with any government body, mean incomes for wheat per tenancy tend to be higher than for cotton (Table 6.13).

6.2.4 Groundnuts

Groundnuts are cultivated on a similar basis to wheat, in that the tenant has complete control over the crop's production and marketing. However, beyond this factor the cultivation of the 2 crops varies considerably, the main difference being that groundnuts require a great deal of labour in many stages of their production. This proved a very important factor in the early years of the scheme, when the crop was very unpopular. Two other factors also helped to bring about this situation: the high costs of cultivation and the low returns from the crop (29). Thus, until the 1969/70 season cultivation of the crop was at its barest minimum, and even now the area cultivated is well below the projected area, which should extend over some 105,000 feddans, (Table 6.14). A similar lack of interest in groundnut cultivation was also discernible through the information gathered through the author's questionnaire survey (Table 6.15). High costs and high labour requirements still discourage a high proportion of

(28) Personal communication: Agricultural Bank, New Halfa.

(29) Khashm el Girba A.P.C. (a) op. cit. p. 7.

Table 6.13. Variations in wheat income for six selected villages on the scheme.

village	mean(total)	standard deviation	mean(per feddan)
Wad Nabar	68.25	32.72	10.40
Umrahau	47.29	19.19	5.74
New Geili	71.57	32.96	13.36
New Reira	60.87	30.46	11.67
New Baraysi	73.38	27.46	10.53
Arrida Shukriya	62.07	43.05	9.31
overall	63.09	32.71	9.80

Figures are in Sudanese pounds.

Source: Author's questionnaire survey.

Table 6.14. Area, production and yield of groundnuts on the scheme. 1964/65 - 1973/74.

year	area	production	yield
1964/65	700	450	0.64
1965/66	2,000	600	0.30
1966/67	5,700	4,270	0.75
1967/68	4,455	4,296	0.96
1968/69	2,315	1,065	0.46
1969/70	34,549	11,746	0.34
1970/71	26,450	11,150	0.42
1971/72	12,905	6,881	0.53
1972/73	40,000	28,000	0.70
1973/74	45,375	22,637.5	0.50

Figures for area are in feddans, for production in tons, and for yield in tons per feddan.

Source: A.P.C. New Halfa.

Table 6.15. Non-cultivation of groundnuts in six selected villages on the scheme.

village	percentage not cultivating
Wad Nabar	47.62
Umrahau	58.62
New Geili	66.67
New Reira	12.50
New Baraysi	-
Arrida Shukriya	33.33
overall	36.72

Source: Author's questionnaire survey.

tenants from cultivating the crop, but the factor which caused the dramatic increase in its cultivation since 1969/70 has been the increase in the profits obtained, which has corresponded to the dramatic increase in the world price for oil products (Table 6.16).

This factor has undoubtedly been an important factor in the rise in the crop's popularity on the scheme and its increased cultivation, but, as with cotton and wheat, wide variations still occur in the income a tenant may receive from the crop. To examine whether these variations (Table 6.17) are a function largely of the yields obtained, the following null hypothesis was set up:

> There is no direct relationship between the yield obtained from the groundnut crop and the income received from that crop.

This hypothesis was tested by means of the correlation coefficient, used at the 0.05 level of significance. A figure of plus 0.8167 was obtained, which, when compared with the appropriate tables (Appendix H) revealed that the null hypothesis should be rejected, signifying that there is a relationship of a significant direct nature between the yield obtained for the crop and the income from it. This is confirmed in the results of regression analysis, which are shown in Figure 6.4. This high level of correlation can be accounted for because of the high rate of sale of the groundnut crop as compared to the wheat crop, running at over 90 per cent (Table 6.18). That proportion of the crop retained is invariably used for the seed for the following year's crop.

Perhaps more so than cotton, groundnuts are dependent for their cultivation upon a tenant's economic viability - the availability of either sufficient capital to meet the necessary costs of seed and labour and/or sufficient labour resources to obviate the necessity of hiring labour. It is, therefore, contended that only the wealthier elements of the population can undertake the cultivation of the crop. To examine this contention the following null hypothesis was set up:

Table 6.16. Variations in the world price of groundnuts.

year	import prices	average producer price
1961	19.0	24.0
1962	16.5	24.3
1963	16.7	24.7
1964	18.4	24.7
1965	21.3	25.1
1966	18.7	24.9
1967	17.2	25.1
1968	16.4	26.2
1969	20.4	27.1
1970	21.5	28.2
1971	25.2	30.0
1972	30.1	31.7

Figures for import prices are those at European ports for Sudanese groundnuts in US cents per kilogram.

Figures for average producer prices are those in the United States in US cents per kilogram.

Sources: 1961-67: F.A.O. Production Yearbook. 1971. Vol. 25. Rome. 1972.

1968-72: F.A.O. Production Yearbook. 1973. Vol. 27. Rome. 1974.

Table 6.17. Variations in the yields of groundnuts in six selected villages on the scheme.

village	mean	standard deviation	median	quartiles upper	quartiles lower
Wad Nabar	12.42	4.52	14.00	16.00	7.00
Umrahau	6.42	2.78	6.30	8.50	4.60
New Geili	5.64	3.46	6.00	9.10	2.00
New Reira	8.46	5.82	7.00	14.00	2.50
New Baraysi	19.57	9.91	18.00	26.00	12.00
Arrida Shukriya	16.38	6.02	16.00	21.00	11.20
overall	12.52	8.31	10.80	16.00	6.00

Figures are in sacks per feddan.

Source: Author's questionnaire survey.

Figure 6.4. Regression analysis on groundnut yield to groundnut income.

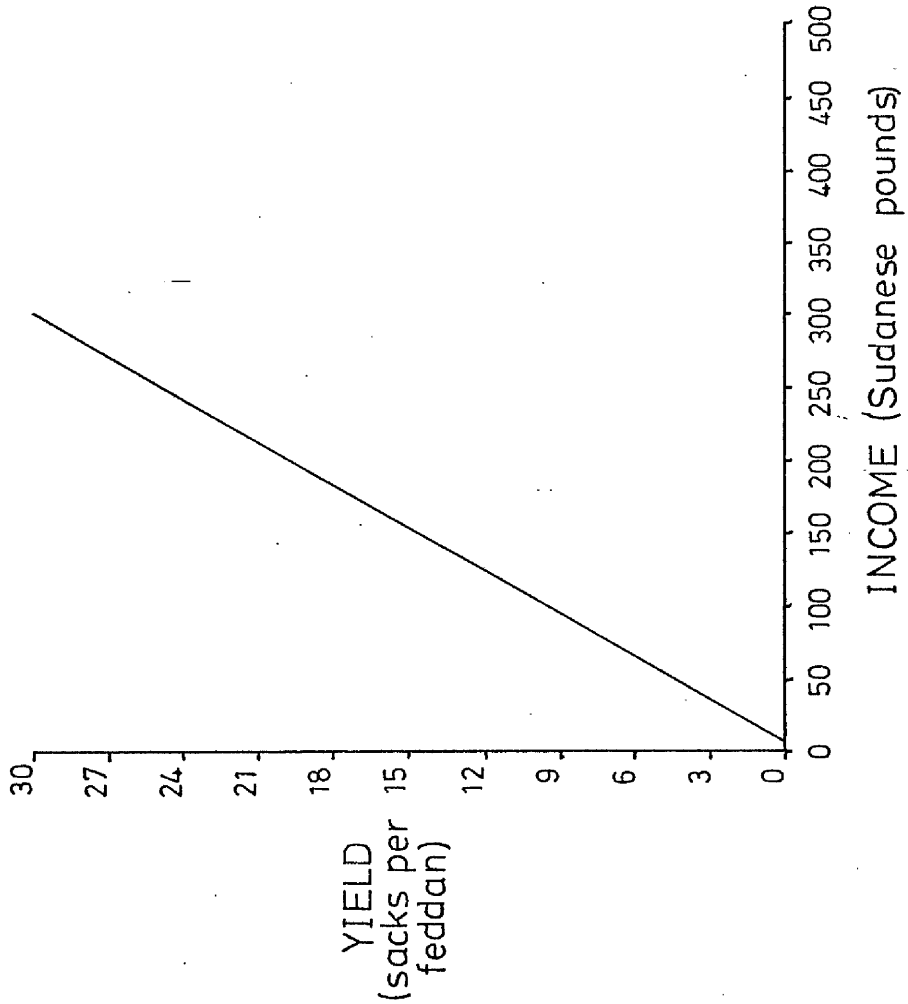

Table 6.18. Sale of the groundnut crop in six selected villages on the scheme.

village	percentage of crop sold	percentage of tenants selling 100 per cent of crop
Wad Nabar	90.44	18.18
Umrahau	84.46	25.00
New Geili	85.82	60.00
New Reira	93.33	66.67
New Baraysi	99.43	94.44
Arrida Shukriya	90.33	46.15
overall	94.47	56.25

Source: Author's questionnaire survey.

> The level of income of a tenant does not influence whether that tenant cultivates groundnuts on the scheme, or does not cultivate groundnuts on the scheme.

As it was desired to discover whether the relationship between the 2 factors, if it existed, was in a specific direction, the Kolmogorov-Smirnov test for 2 independent samples was used, utilising the one-tailed test. Consequently, an alternative hypothesis had to be established, as follows:

> Those tenants with higher incomes are more likely to undertake the cultivation of groundnuts on the scheme than those with lower incomes.

The test was applied at the 0.05 level of significance, and a figure for Chi-squared of 20.5012 obtained. Comparison of this figure with the Chi-squared tables at 2 degrees of freedom and a level of significance of 0.05 (Appendix I) showed that the null hypothesis could be rejected in favour of the alternative hypothesis, so that those tenants with higher incomes generally are more likely to cultivate groundnuts than those with lower incomes. Thus, the cultivation of the crop is largely the prerogative of the wealthier elements of the population. However, it is possible for those tenants with insufficient resources of their own to cultivate groundnuts, through the utilisation of loan facilities, which are available on the scheme. Seventy per cent of the tenants who took out loans did so in order to be able to cultivate groundnuts (30), and in view of the importance of loans in the cultivation of groundnuts on the scheme, it is appropriate here to examine the facilities available for loans, and, in addition, their utilisation.

If a tenant wishes to borrow money for any purpose, there are 3 main options open to him. Some of the facilities provided are operated on a credit basis, but there are also extensive facilities for cash loans.

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(30) From the author's questionnaire survey.

a) Credit Facilities. These come from 2 main sources: a tenant can go to merchants or other private individuals within the scheme, usually in the towns of New Halfa, Massna or Khashm el Girba, who offer credit facilities on items which he may wish to purchase, such as sugar, oil and tea. He can also receive assistance from the A.P.C. who provide services such as the spraying of the wheat and groundnut crops, or the provision of fertilisers for these crops, which are not charged immediately to the tenant, but are deducted from his income for cotton under the individual account (31). Such services are, therefore, operated under credit conditions.

b) Cash Loans. Cash loans can also come from the above sources, but in addition are available from the Agricultural Bank in New Halfa. Thus, of those tenants interviewed who had taken out loans, 13.16 per cent obtained them from the A.P.C., 39.51 per cent from merchants and other private sources, and 47.33 per cent from the Agricultural Bank. The least important of these sources appears to be the Corporation, and this can be accounted for by the high rates of interest which the A.P.C. charges its clients, running at 14.6 per cent per annum. The loans taken out on such terms tend to be short-term, of 2 or 3 months duration, and repaid as soon as possible. In contrast, loans from merchants and other private sources - which often means members of the same extended family - do not usually carry interest charges, and if they do, they are at a very low level, running at one to 2 per cent. As a result such loans are very popular and widely made use of.

The Agricultural Bank is the main official source of credit facilities on the scheme, and provides loans of 3 types: seasonal loans, intermediate loans, and loans designed to aid the cultivation of wheat and groundnuts.

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(31) See page 199.

The extent of the use of such loans is demonstrated in Tables 6.19 to 6.21, which reveal that, although their utilisation was at a low level in the early years of the scheme, recently they have become widely used, particularly those loans made available for the cultivation of wheat and groundnuts. The rates of interest charged by the Bank vary according to whether the tenant is a member of a co-operative or not. If he is a member a rate of 6 per cent is charged. If he is not a member the rate is increased to 8 per cent (32). As shown earlier, many of these loans are used to aid in the cultivation of groundnuts, and their use is fairly widespread as is shown in Table 6.22. Amounts borrowed vary from as low as LS 10 to over LS 100, averaging out at about LS 35. Most of the loans taken out are for the purchase of seed for groundnuts, or for the hire of labour for the same crop, but they may also be required for the hire of machinery or the purchase of fertilisers (33).

Groundnuts are a crop requiring high labour inputs, and many of the loans obtained by tenants were taken out to enable them to hire sufficient labour for the crop's cultivation. It is to be expected therefore that some significant relationship would be observable between labour inputs and yields of groundnuts obtained. To examine this possibility the following null hypothesis was established:

> There is no significant difference between the yields obtained by those tenants using high labour inputs and those obtained by tenants using low labour inputs.

High and low labour inputs were defined according to whether a tenant and his labourers had put in more or less respectively than the average number of man-hours per day, which was calculated at 35.95. As it was desired to discover whether those with high labour inputs achieved better yields than

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(32) M. Bardeleben op. cit. p. 63.

(33) Personal communication: Agricultural Bank, New Halfa.

Table 6.19. Seasonal loans provided by the Agricultural Bank in New Halfa. 1966/67 - 1974/75.

year	number of loans	amount loaned
1966/67	13	9172.000
1967/68	127	36070.060
1968/69	261	52832.840
1969/70	309	31453.175
1970/71	298	38595.275
1971/72	213	12694.240
1972/73	64	2280.085
1973/74	338	10022.740
1974/75	75	4356.000

Figures for amount are in Sudanese pounds.

Figures for 1974/75 only include the period up to 31/12/74.

Source: Agricultural Bank. New Halfa.

Table 6.20. Intermediate loans provided by the Agricultural Bank in New Halfa. 1965/66 - 1974/75.

year	number of loans	amount loaned
1965/66	2	4500.000
1966/67	8	15867.000
1967/68	16	39110.800
1968/69	17	42463.800
1969/70	20	56227.000
1970/71	10	18483.127
1971/72	210	460934.134
1972/73	90	130230.080
1973/74	40	30400.000
1974/75	10	19755.000

Figures for amount are in Sudanese pounds.

Figures for 1974/75 only include the period up to 31/12/74.

Source: Agricultural Bank. New Halfa.

Table 6.21. Loans for wheat and groundnuts provided by the Agricultural Bank in New Halfa. 1965/66 - 1974/75.

year	number of loans	amount loaned
1965/66	25	28030.000
1966/67	23	4784.003
1967/68	286	135194.927
1968/69	150	8194.633
1969/70	243	68329.350
1970/71	45	49975.100
1971/72	4225	63328.500
1972/73	7765	251622.400
1973/74	4230	145066.380
1974/75	4055	105113.000

Figures for amount are in Sudanese pounds.

Figures for 1974/75 only include the period up to 31/12/74.

Source: Agricultural Bank. New Halfa.

Table 6.22. Utilisation of loans in six selected villages on the scheme.

village	percentage of tenants borrowing money	average amount borrowed
Wad Nabar	30.77	38.25
Umrahau	23.53	37.37
New Geili	13.33	39.00
New Reira	25.00	43.17
New Baraysi	29.57	32.00
Arrida Shukriya	36.00	27.44
overall	26.90	35.41

Figures for amount are in Sudanese pounds.

Source: Author's questionnaire survey.

those with low labour inputs the Kolmogorov-Smirnov one-tailed test for 2 independent variables was used, and consequently an alternative hypothesis had to be established:

> Those tenants with a high usage of labour obtain significantly higher yields than those tenants with a low labour usage.

A figure for Chi-squared of 4.97 was obtained, which when compared with the Chi-squared tables at 2 degrees of freedom and a level of significance of 0.05 (Appendix I) revealed that the null hypothesis had to be accepted in favour of the alternative hypothesis. Consequently, no significant difference is discernible between the yields of those tenants who are high users of labour and those who are low users. Although labour, therefore does not appear to significantly affect yields, it is still an important aspect in the cultivation of groundnuts, for in all stages of its production, except the preparation of the land, manual labour is necessary, and although attempts are being made to increase the role of mechanisation in groundnut production at Khashm el Girba (34), manual labour is still extremely important in the harvesting stage of production, while there is a constant need for weeding in order to maintain the crop's output.

Groundnuts above all need money and/or labour resources for their production on effective lines. If a tenant has neither of these resources he is faced with only 2 alternatives: he can decide not to cultivate the crop at all, thereby sacrificing the possibility of a large income, for groundnuts are the most remunerative crop of the 3 in the rotation; or he must borrow money from one of the 3 sources mentioned earlier, in order to buy seed and to hire labour.

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(34) Democratic Republic of the Sudan (c) Ministry of Planning "The 5 Year Plan for Social and Economic Development of the Democratic Republic of the Sudan for the Period 1970/71-1974/75", Khartoum 1970.

Other factors have been mentioned in connection with the production of cotton and wheat, notably the dates of sowing and harvesting, but in the case of groundnuts neither factor assumes significant proportions, for the tenants tend to follow a very uniform pattern in their sowing and harvesting dates. Thus, approximately 95 per cent of tenants cultivating groundnuts sowed during the month of July, while an equally high proportion harvested the crop during the month of December.

The cultivation of groundnuts involves high costs, and has been shown to be the prerogative largely of the richer members of the population. Despite the high costs involved, however, the crop is now the most remunerative of the 3 crops in the rotation, although this situation has only obtained in recent years since the rise in the world price of the crop (35). Thus, income from a 5 feddan plot averages nearly LS 150 amongst those tenants interviewed (Table 6.23), and a mean return per feddan of over LS 25.

6.2.5 Individual Case-Study

In an attempt to more closely analyse the requirements of the crops, it was decided to examine the situation of one individual tenant, growing all 3 crops on the rotation, as a case study. Rizeyg lives in a village in the centre of the scheme, New Reira, and came to the scheme to take up a tenancy in 1967. His family consists of 7 members, including himself and his wife, 3 sons aged 17, 13 and 7, and 2 daughters aged 6 and 4. Of these, the 2 younger sons attend the elementary school in the village, while the eldest helps his father to work the tenancy. Rizeyg cultivates all 3 crops in the rotation, sowing groundnuts in July and harvesting in December, sowing his cotton crop in August and harvesting in February, and planting his wheat in November to be harvested in March. Apart from his tenancy he has no other source of income, but keeps a small number of animals to

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(35) See page 221.

Table 6.23. Variations in groundnut income in six selected villages on the scheme.

village	mean(total)	standard deviation	mean(per feddan)
Wad Nabar	140.45	45.25	19.31
Umrahau	80.55	48.12	14.42
New Geili	102.33	9.18	12.28
New Reira	118.65	92.08	22.60
New Baraysi	174.72	81.33	34.94
Arrida Shukriya	183.54	104.47	34.94
overall	146.03	87.16	27.90

Figures are in Sudanese pounds.

Source: Author's questionnaire survey.

provide him with milk, and a means of transport to his tenancy, and to these ends owns one cow, one camel and 5 sheep.

From the cotton crop in season 1973/74 Rizeyg had a yield of 23 kantars from his 5 feddans, all of which went to the A.P.C.: from his wheat he received 15 sacks, although he only sold 9 of these, while his groundnut crop yielded 50 sacks, of which he sold 44 sacks, retaining the other 6 sacks for the following year's crop. Consequently, his income from the 3 crops cotton, wheat and groundnuts was LS 49, LS 54 and LS 120 respectively, giving an overall income of LS 223. Income from his cotton crop was worked out according to his individual account and his joint account with the Corporation, but on top of this he received $5\frac{1}{2}$ millimes for every pound of cotton picked, which was intended to go towards the costs of any hired labour he might require. As he only paid his hired labour $3\frac{1}{2}$ millimes per pound picked, he made an additional profit on his cotton of 2 millimes per pound. In all this amounts to an extra LS 18 for his 23 kantars (36). In the case of wheat, however, all preparation, planting and harvesting is done by mechanised means, the cost of which is borne jointly by the tenant and the Department of Agriculture: in season 1973/74 the total cost of such operations was LS 7 per feddan, of which Rizeyg had to contribute only LS 3, which constitutes a total expenditure on his 5 feddans of wheat of LS 15. Thus, for cotton and wheat, additional expenditures and income more or less balance each other out.

However, the costs incurred in the cultivation of groundnuts are much greater. Seed for the crop cost LS $3\frac{1}{2}$ per sack in season 1973/74, and as for a 5 feddan plot 6 sacks of seed are required the total expenditure on seed would amount to LS 21. However, in Rizeyg's case, this cost was not incurred, as he had retained 6 sacks of the previous year's harvest

(36) One large kantar is equal to 315 pounds.

precisely for this purpose - other tenants prefer to sell all their crop, so that they can have the cash available, so that for such tenants it is necessary to buy fresh seed each season. The labour requirements for the crop are the chief source of expenditure: thus, in 1973/74 season Rizeyg had in all to pay LS $3\frac{1}{2}$ for the planting operations, and a further LS 22 for the picking and gathering of his crop. In addition to this, a further cost of 30 P.T.s per sack was incurred for the separation process, which is carried out mechanically; as he had 50 sacks of groundnuts, this amounted to a cost of LS 15. In total, therefore, his costs in producing groundnuts amounted to LS $40\frac{1}{2}$. Like many other tenants cultivating groundnuts, Rizeyg had to resort to borrowing money to enable him to cultivate the crop. This he did from the Agricultural Bank, from whom he borrowed LS 35; because he is a member of the co-operative in New Reira his rate of interest on this loan was 6 per cent, but he was able to repay this money as soon as he had harvested and sold his crop. In addition to these costs, Rizeyg employed on a regular basis 3 labourers to help him to keep the tenancy free from weeds. Each received 15 P.T.s for a day's work, and each worked on average 100 days during the season, which amounts to further expenditure of LS 45. Consequently, from his gross income of LS 223 must be deducted the general agricultural labour costs of LS 45 and groundnut costs of LS $40\frac{1}{2}$, giving Rizeyg a net income of just over LS 140.

Out of this income, Rizeyg has to feed his family of seven. The basis of the diet on the scheme, and indeed throughout much of northern Sudan, is dura (sorghum vulgaris), which he must purchase from Massna at LS 5 per sack. As one sack lasts approximately one month in all 12 sacks are required to last throughout the year. However, Rizeyg economises on this expenditure by retaining some of his wheat crop, and mixing it with dura. In season 1973/74 he saved 6 sacks of wheat, and therefore only had to buy 6 sacks of dura, which cost him LS 30. The other main items which he must

buy for his family's diet are milk, which is provided by the cow, sugar, tea and coffee. Sugar costs 15 P.T.s per pound, and, as between one and $1\frac{1}{2}$ pounds are consumed every day, the expenditure in a year amounts to between LS 55 and LS 80. Coffee and tea both cost 40 P.T.s per pound. One pound lasts approximately 10 days and 3 weeks respectively, constituting an annual cost of LS 14.6 and LS 7 respectively. Further, Rizeyg must purchase water at 1 P.T. per tin, and as he uses 3 tins every 2 days, this costs him annually LS $5\frac{1}{2}$. Thus, on the basic necessities he spends somewhere between LS 112 and LS 136 in a year, which leaves him very little from his net income of LS 145.

Thus, Rizeyg is barely able to manage to live from the income he receives from his tenancy, and the level of his income is largely due to the fact that he cultivates groundnuts, which, although incurring a large proportion of his costs, also constitutes the major source of his income. If anything, Rizeyg is slightly above the average for both his own village, where the mean income is just below LS 200, and for the scheme as a whole, with an average income of LS 175.

6.2.6 Summary

The rotation at Khashm el Girba has been criticised as:

> ". . . . . not the best combination either in terms of annual gross return per feddan or in gross returns per cubic metre of water". (37)

and from the foregoing discussion of the 3 crops in the rotation, problems can be seen to be concerned with each one. Cotton is the main crop of the rotation, but for the tenants it is also the least profitable of the 3, returns being significantly below those of wheat and groundnuts (Table 6.5). For some tenants, however, cotton is the only source of income from the rotation, for several reasons: first, they decide not to, or cannot afford

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(37) G. el Din Sid Ahmed (a) op. cit. p. 161.

to cultivate groundnuts; and second, the wheat crop may fail. For tenants in such a situation, income is scarcely adequate, especially when compared with Rizeyg's situation, where even cultivation of all 3 crops only gives him a slight profit on his tenancy once his subsistence needs have been accounted for. In the season 1973/74, the price paid to each tenant per kantar produced was calculated by the Corporation at slightly over LS 2. Therefore, even if yields were extremely high, at 6 or 7 large kantars per feddan, total income from cotton could only amount to LS 70, but at the mean yield of 3.7 large kantars per feddan the income would amount to just below LS 40, and such figures ignore any deductions which may be made from them according to each tenant's individual account.

If wheat and groundnuts are cultivated in addition, income becomes more reliable and larger in amount, as both crops are generally more remunerative than cotton. Nevertheless, both crops have their problems: wheat is the easiest of the crops to cultivate, but is the crop which is most affected by the recurrent water shortage problem, which causes both crop losses and a lowering of yields, both leading to depressed returns; groundnuts are expensive to cultivate, and require high inputs of labour, factors which tend to discourage their cultivation by those tenants who would probably most benefit from the crop's high returns - namely the poorer tenants.

The overall mean income from a tenancy works out at just below LS 175 (Table 6.5), but as seen in the case-study on Rizeyg, this gross figure may be reduced by as much as LS 50 or more by additional costs, particularly those relating to the hire of labour. It is worth comparing these figures for income from agriculture on the scheme, with estimates of income from the pastoral existence which the tenants have left. Thus, another estimate of mean income from agriculture on the scheme stands at LS 150 (38), a

(38) M. H. Abu Sin "The Regional Geography of the Butana North of the Railway", M.A. Thesis, Khartoum 1970 p. 114.

figure which approximates closely to those worked out for the 6 villages surveyed. Such figures, however, do not compare favourably with estimates of income from livestock: from an average-sized sheep flock of approximately 200 head, the mean annual income has been estimated at LS 150; from an average camel herd of 60 head the mean income could be as much as LS 180; and from an average cattle herd of 40 animals the mean annual return could be LS 120 (39). In addition, a nomad could expect an income of anything up to LS 60 from rainfed cultivation of dura (40). An interview with one of the local tribal leaders supported this, for it was reported that, in a good season income from a tenancy could reach as much as LS 300, but the sale of only 2 camels could bring a corresponding income.

Income from agriculture on the scheme does not, therefore, appear to compare too favourably with income from livestock. Such a situation helps to explain why many of those nomads who have taken up tenancies on the scheme have also retained interests outside the scheme. To examine whether such economic diversification, and lack of total dependence upon the scheme's agriculture is economically beneficient to the tenants it was decided to compare the respective incomes of those with and those without alternative sources of income to agriculture on the scheme. The data obtained from the questionnaire survey was, consequently subjected to the Kolmogorov-Smirnov one-tailed test for 2 independent samples, and the following null and alternative hypotheses established:

H_0 There is no significant difference between the incomes of those tenants whose sole source of income is from agriculture on the scheme and the incomes of those tenants who also have an alternative source of income to agriculture on the scheme.

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(39) Ibid. p. 158.

(40) Ibid. p. 114.

H_1 Those tenants who have an alternative source of income to agriculture on the scheme have significantly higher incomes than those tenants whose sole source of income is from agriculture on the scheme.

A figure for Chi-squared of 25.0879 was obtained which at 2 degrees of freedom and a level of significance of 0.05, means that the null hypothesis can be rejected in favour of the alternative hypothesis, so that economic diversification and lack of total dependence upon agriculture on the scheme is economically beneficient to the tenant.

Thus, returning to the original hypothesis of this section which suggested that the rotation on the scheme provides an adequate economic base for the inhabitants of the scheme, the preceding analysis and discussion suggests that such is not the case for many of the settlers: at the poorer end of the scale the tenant is scarcely able to make enough money to subsist on, while those tenants with more economic resources find it economically more beneficient to diversify their sources of income and not to be dependent upon the rotation. This second point will be dealt with shortly in more detail, but with regard to the rotation, it appears to be not a particularly viable combination for the tenants, because of the various problems which face the tenants in their cultivation of the various crops, and in view of this situation the attempts by the settlers to diversify their sources of income are a rational response to existing economic conditions.

6.3 Non-Tenant Economic Activities

Although tenant agriculture is the chief economic activity within the scheme, many inhabitants of nomadic origin do not depend upon a tenancy for their livelihood. However, the chief alternative is still closely connected with the agriculture of the scheme in the form of agricultural labouring, but other occupations are also followed by certain individuals. As was outlined earlier, the participation of people of nomadic or even Nubian origin in the industries situated in New Halfa and Massna is limited (41),

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(41) See page 140.

but within government bodies certain opportunities do exist. Such employment usually takes the form of labouring for the Ministries of Agriculture or Irrigation, at such work as maintaining the condition of the major canals. This type of employment brings a more regular and reliable income than does agriculture, wages for labourers in both Ministries averaging between LS 250 and LS 300 per annum (42).

Employment of hired labour on the scheme by tenants is a widespread practice (43). While in practically all instances family labour is utilised, a high proportion of hired labour is also generally used, (Table 6.24). However, not all labour that is hired is of nomadic origin, a significant proportion being derived from tribes of western origin, particularly from the Fur and Zaghawa tribes (Table 6.25). Nevertheless, a large proportion of the hired labour employed is taken from nearby nomadic tribes, the main groups being the Beni Amer and the Hadendowa tribes, both of Beja stock. Consequently the discussion will be confined to the hired labour whose origins are in the local nomadic tribes. The work that these labourers undertake covers all aspects of cultivation: planting, weeding and gathering, although the bulk of their time is spent in keeping the tenancies free from weeds, the other tasks being restricted to specific periods during the year, although harvesting takes place more or less continuously from mid-December to March or even April. Such labourers may work anything from 6 to 10 hours a day through most of the season, for which they may be paid the meagre wages of between 15 and 25 PTs per day. Thus, for labouring throughout the season, which might last from 150 to 200 days it would be possible for such a labourer to earn, in all, between LS 25 and LS 50 per annum. In addition to these wages,

(42) Personal communication: Ministries of Agriculture and Irrigation.

(43) See page 195.

Table 6.24. Utilisation of hired labour in six selected villages on the scheme.

village	mean no. family labour used	mean no. hired labour used	mean no. total labour used	percentage using no hired labour
Wad Nabar	1.52	3.10	4.62	14.29
Umrahau	1.72	2.28	4.00	44.83
New Geili	1.93	2.40	4.33	26.67
New Reira	1.71	1.79	3.50	37.50
New Baraysi	2.06	3.06	5.11	27.78
Arrida Shukriya	1.90	3.81	5.71	14.29
overall	1.79	2.70	4.48	28.91

Source: Author's questionnaire survey.

Table 6.25. Utilisation of hired labour: tribal breakdown in six selected villages on the scheme.

village	tribe Beni Amer	Hadendowa	Shukriya	Rashaida	Fur	Zaghawa
Wad Nabar	35.38	43.08	-	-	13.85	7.69
Umrahau	43.75	25.00	-	10.94	21.87	1.56
New Geili	42.86	-	-	-	11.43	45.71
New Reira	34.88	-	-	-	6.97	58.14
New Baraysi	43.64	1.82	14.55	-	12.73	27.27
Arrida Shukriya	41.89	-	-	-	20.27	37.84
overall	38.55	13.63	2.32	2.03	17.39	26.09

All figures are in percentages.

Source: Author's questionnaire survey.

however, a tenant is required to provide his labourers with 2 or 3 sheep or goats for subsistence. As a rule such labour lives on or near the tenancy rather than in the village, and they use tent dwellings rather than mud-built ones (Table 6.26). With the meagre income and meagre resources available to the agriculture labourer, he cannot be said to be living at anything other than a subsistence level, his wages barely being enough to provide him with sufficient food for each day.

6.4 The Role Of Livestock

6.4.1 Introduction

Livestock have been the basis of existence for the population of the Butana for centuries, and the extent of the livestock population of the area prior to the scheme's development was considerable (Table 6.27). However, little, if any, account has been taken of these livestock resources in the planning context of the scheme in its attempts to settle nomads, each tenant only being allowed to keep a limited number of animals within the scheme area (44). Such animals are kept for domestic purposes, either to provide milk or as a means of transport. Neither did the planning context of the scheme allow for the cultivation of any fodder crop. Such a planning policy has already been criticised:

> "At Khashm el Girba the ex-nomadic tenants will grow neither millet nor fodder; the divorce with their past way of life will be complete. They will have to make drastic and, it seems, unnecessarily great adaptations to their new environment which may result in considerable inefficiency during the period of adjustment. Moreover it appears economically wasteful to neglect the nomads' skill in animal husbandry". (45)

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(44) Reports of the actual numbers allowed to each tenant vary: one village chief said that each tenant is only allowed 3 animals, whereas officials in New Halfa reported that each tenant was allowed to keep either 2 cows or 5 sheep.

(45) Republic of the Sudan (h) Ministry of Finance and Economics "Roseires Pre-Investment Survey", Report No. 2 'Rahad Project', Vol. IV Agriculture, Huntings Technical Services Ltd. London 1965 p. 73.

Table 6.26. Place of residence of hired labour in six selected villages on the scheme.

village	percentage of hired labour living on tenancy	percentage of hired labour living in village
Wad Nabar	94.64	5.36
Umrahau	100.00	-
New Geili	91.67	8.33
New Reira	73.92	26.08
New Baraysi	85.46	14.54
Arrida Shukriya	90.12	9.88
overall	90.00	10.00

Source: Author's questionnaire survey.

Table 6.27. Estimates of livestock populations in the eastern Butana prior to the establishment of the scheme.

tribe	camels	cattle	sheep	goats
Shukriya	92,000	77,000	165,000	120,000
Lahawin	114,000	6,000	97,000	65,000
Kenana	20,000	2,000	3,000	25,000
minor tribes	33,000	18,000	33,000	24,000
total	259,000	103,000	298,000	234,000

Source: I.L.O. Report to the Government of the Sudan on the sedentarisation of nomadic tribal populations in the Butana region of Northern Sudan. Study Planning Mission. Nov 1963 - Feb 1964. ILO/TAP/Sudan/R.8. EPTA. Geneva. 1965.

However, the concept of a complete breakaway from livestock was not always present in the planning of the scheme, for at its very outset, there was:

> ". . . . . the suggestion of the Executive Committee of Kassala Province that the settlement of the local people should aim at the establishment in those 25,000 feddans of a kind of mixed husbandry, including both agriculture and cattle breeding". (46)

But, in the event, this idea was discarded, and economic activity within the scheme is now confined purely to agriculture. This has occurred in spite of the fact that authorities both inside and outside the Sudan consider livestock to be one of the country's major assets. The reason for discarding animal husbandry may, however, possibly be found in the following explanation:

> "Future rural development in the Province (Kassala) will concentrate on increased crop production wherever possible, because of its greater profitability per unit area of land, compared with that of animal husbandry". (47)

This view is supported by el Tayeb, who, in comparing various types of land use, puts livestock as the least economic alternative in terms of return per unit area of land, as is shown in Table 6.28 (48).

In spite of such factors and the lack of provision for livestock in the planning of the scheme, it is contended here that the reality of the situation is such that a complete "divorce with their past way of life" has not taken place amongst the settling nomads, and that livestock still plays an important role in the economic life of a significant proportion of the settled population. Consequently, the following hypothesis was established:

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(46) I.L.O. Report to the government of the Republic of the Sudan on the Sedentarisation of Nomadic Tribal Populations in the Butana Region of Northern Sudan , Study Planning Mission November 1963-February 1964 'Expanded Programme of Technical Assistance', Document ILO/TAP/Sudan R.8. I.L.O., Geneva 1965 p. 14.

(47) Sir A. Gibb and Partners "Kassala Province Survey", London 1968 p. 193.

(48) G. el Din el Tayeb "Forestry and Land Use in Sudan", Khartoum 1972 p. 51.

Table 6.28. Net returns per feddan for selected land use types in the Sudan.

land use type	wholesale value	retail value	export value
firewood(planted Eucalyptus)	0.91	1.45	
teak plantation	23.50		148.50
Egyptian cotton:			
Gezira	22.21		55.33
Sudan	20.07		50.67
American cotton:			
irrigated	17.77		45.82
flood	8.86		25.68
rain	2.91		6.27
dura cultivation:			
irrigated	5.35	14.42	15.72
flood	3.69	9.68	10.54
rain	3.54	8.77	9.52
groundnut cultivation:			
irrigated	8.83	13.35	23.18
flood	3.50	5.26	9.08
rain	4.73	7.22	12.63
wheat cultivation:			
irrigated	9.14	21.97	23.78
flood	11.60	26.40	29.06
livestock: sheep	0.52	0.07	0.08
cattle	0.04	0.07	0.08
camels	0.10	0.12	0.18

Figures are in Sudanese pounds per feddan.

Source: G.D. el Tayeb. Forestry and land use in the Sudan. Khartoum. 1973.

The settlement and involvement of nomads in the agriculture of the scheme at Khashm el Girba has not resulted in a decline in the importance of livestock to the population involved.

6.4.2 The Extent Of Interest In Livestock Amongst Ex-Nomadic Tenants On The Scheme

As the government, in its planning of the settlement of nomads on the scheme, did not take into account or make provision for the maintainance of interests in livestock, the tenants who wished to maintain such an interest had to make their own adaptations to the new environment. As has already been established (49), many of the tenants of the scheme are not present within the agricultural area throughout the year - they rather remain in the Butana with their livestock for much, or even the whole of the year. In addition to this proportion of the population, however, many of those tenants who have permanently settled may continue to maintain their interests in livestock rearing.

Reservations have already been made relating to the reliability of the data collected about livestock in the author's questionnaire survey, but it was assumed that erroneous reply would only apply to actual numbers of livestock owned and not to ownership itself (50). Consequently it was assumed that any tenant admitting to owning livestock on the Butana still maintained an active interest in livestock rearing. Furthermore, any tenant admitting to owning more than the permitted number on the scheme, but not necessarily admitting that such animals used the Butana, must also have a similar interest. Due to the discrepancies in the reports of numbers allowed (51), a figure had to be fixed, and to this end the ownership of 10 or more animals was used, such a figure being, it was felt, on the conservative

(49) See page 127.

(50) See page 41.

(51) See footnote 43 of this Chapter.

side. Figures relating to these criteria are presented for the 6 villages surveyed in Table 6.29, and reveal that approximately 25 per cent of the settled households in all the villages still maintained links with livestock.

At this point it is felt worthwhile to examine some individual case studies of tenants in their relationship to and uses of livestock resources. Thus, Awad who lives in Umrahau, admitted to owning large herds of camels (60 head), cattle (70 head) and goats (100 head) which he grazes in the Butana for most of the year, the goats and cattle returning to the village in February or March, while the camels remain on the plain throughout the year. These herds are tended by 2 of the tenant's sons. The remainder of the family, numbering 9 in all, reside in Umrahau, and from there Awad works not only his own tenancy but also those of his 2 sons. During the course of 1974 he sold 6 camels which fetched LS 270, 20 head of cattle fetching LS 240, and 50 goats fetching LS 140. The camels and cattle were sold at Ed Damer on the main Nile north of Khartoum, and the goats at Tambul near Rufa'a on the Blue Nile in the western part of the Butana. Awad's total income from livestock, therefore, amounted to LS 650, compared to the income which he received from the 3 tenancies of approximately LS 300. His continued dependence on and interest in livestock has been facilitated by the large size of his family, which enables him to send 2 members of the family with the family herds. At the same time, because of the wealth accrued through the livestock, Awad was able to hire enough labour to look after all 3 tenancies held by members of his family, although relatively low returns - about LS 100 per tenancy - suggests a lack of interest in and commitment to agriculture on the scheme. This particular adaptation is fairly common amongst households with large families, and sizeable herds in the Butana: a division of labour takes place between the members of the household. In some cases it is the sons

Table 6.29. Continued interests in livestock in six selected villages on the scheme.

village	owning livestock	owning ten or more livestock	owning livestock grazing in the Butana
Wad Nabar	84.62	26.92	23.08
Umrahau	79.41	32.35	47.06
New Geili	93.33	26.67	26.67
New Reira	83.33	16.67	20.83
New Baraysi	33.33	14.29	19.04
Arrida Shukriya	60.00	40.00	44.00
overall	68.42	26.21	31.72

All figures are percentages.

Source: Author's questionnaire survey.

of the household who carry out the herding, while in others it may be a father and a son. Indeed, the majority of households with livestock in the Butana tend to utilise family labour rather than hiring shepherds; the findings of the questionnaire survey revealed that just under 70 per cent of herds kept by tenants in the Butana were herded by members of the family.

In some instances, however, shepherds are hired to look after the herds in the Butana. Boshara, who lives in New Geili, is just such a tenant. He admitted to keeping modest-sized herds in the Butana, with 5 head of cattle, 2 camels and 20 sheep. He hires a shepherd to look after his herds during the scheme's growing season when he is busy with his crops, but has them brought onto the scheme after the season has finished so that they can graze on the stubble of the crops, from April to July. The sale of one cow and 5 sheep in New Halfa brought him an income of LS 70 in 1974, which was slightly below his income from his tenancy, which stood at LS 125. This income came from the cultivation of cotton and wheat only, as he felt that groundnuts were too expensive to cultivate. Consequently, to this tenant livestock are still of considerable importance in providing him with a supplementary income to that which he receives from his tenancy. The connection with the scheme is closer than in the first case study, but livestock retain considerable economic importance.

Finally it is worthwhile examining the case of a tenant whose commitment to the scheme is almost complete, and whose relationship to livestock is within the framework established within the scheme. Thus, Abdouni lives in New Sufeiya and has a family of 5, including himself; all his children are young and cannot help him work his tenancy, where he has to employ 2 hired labourers. He has no animals in the Butana, but keeps 2 sheep and one cow in his house in the village to provide him and his family with milk and wool, but apart from those his divorce with his traditional

dependence upon livestock is complete. However, even before the scheme he only had small herds, and upon taking a tenancy these he had to sell, as he had neither the resources nor the time to maintain them in the Butana. He preferred to concentrate on agriculture on the scheme, which yields an annual income of between LS 150 and LS 175, which he finds is sufficient to meet the needs of himself and his family.

Through these case studies, 3 different types of adaptation have been illustrated: first, those who, though they may have settled on the scheme and practice agriculture, are still dependent primarily upon livestock; second, those who though they have settled on the scheme and receive the greater proportion of their income from agriculture on the scheme, still maintain their interests in livestock; and finally, those who have completely given up dependence on livestock for settled agriculture.

It is possible that such adaptations are related to a tenant's overall wealth. To further investigate this possibility, examination was made of the relationship between total income and the ownership of livestock. To this end the following null hypothesis was established:

> There is no significant difference between the total income of a tenant who owns livestock on the Butana, and that of a tenant who does not own livestock on the Butana.

This was tested using the Chi-squared statistic at the 0.05 level of significance. A figure for Chi-squared of 29.087 was obtained, which when compared with the Chi-squared tables at 12 degrees of freedom revealed that the null hypothesis should be rejected. The significance of the difference between incomes of those tenants who do not own livestock in the Butana and those who do is further reinforced, when the mean incomes of the respective groups are compared (Table 6.30). This table suggests that only those tenants with large incomes are able to maintain herds in the Butana. To test this contention statistically it was decided to subject the data to the Kolmogorov-Smirnov one-tailed test for 2 independent samples.

Table 6.30. Differences in income in six selected villages on the scheme according to the ownership of livestock in the Butana.

village	those with livestock	those without livestock
Wad Nabar	304.33	218.80
Umrahau	317.44	155.28
New Geili	199.67	181.09
New Reira	405.33	182.89
New Baraysi	487.25	252.82
Arrida Shukriya	350.55	343.64
overall	342.20	220.04

Figures are mean incomes for inhabitants in the villages in Sudanese pounds.

Source: Author's questionnaire survey.

Consequently, the following null and alternative hypotheses were established:

H_0 There is no significant difference between the incomes of those tenants who do have livestock in the Butana, and those who do not have livestock in the Butana.

H_1 Those tenants who do have livestock in the Butana have significantly higher incomes than those tenants who do not have livestock in the Butana.

The test was operated at the 0.05 level of significance and a figure for Chi-squared of 10.5034 obtained. At the 0.05 level of significance with 2 degrees of freedom the null hypothesis can therefore be rejected in favour of the alternative hypothesis. Thus, those tenants who do keep livestock in the Butana do have higher incomes than those who do not. This may be part of a self-perpetuating relationship, whereby the ownership of sizeable herds in the Butana prior to the establishment of the scheme has enabled tenants either to achieve good returns in agriculture on the scheme, as they are able to afford the required inputs, which in turn allows them to continue to maintain their herds in the Butana, or not to need to work particularly hard at their tenancies income from livestock still being adequate, and any income from the tenancy serving as a supplement to this. However, such a relationship may work in the opposite direction for those who had only a few animals before the scheme came into existence, a high income from agriculture on the scheme being prevented by such a tenant's lack of adequate resources. In either case the introduction of the scheme appears to have perpetuated the existing structure.

From the preceding discussion it can be seen that amongst a significant proportion of the former nomads who have now settled on the scheme, livestock still plays an important economic role. But apart from these tenants, there have already been mentioned other tenants who have not settled permanently on the scheme, and which have been estimated to number approximately half the total tenants (52). For such tenants 2 options are

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(52) See page 127.

available: one involves their presence on the scheme in August to plant the cotton crop, and again in January and February to harvest the crop. The remainder of the year they can spend with their herds, wandering the Butana plain. To such tenants the scheme has become another resource to be exploited in their migratory cycle. The second alternative involves virtually no contact with settled agriculture in the scheme: the tenant rents out his tenancy to one or more of the other inhabitants of the scheme, to whom is left the cultivation of the crops and the profits therefrom. Thus, one tenant, whose tenancy lies near the village of Arrida Shukriya in the west of the scheme, rented his tenancy in 3 5-feddan plots to 3 different inhabitants of that village at a rent of LS 15 per plot. Consequently, for no work at all, and not even his presence on the scheme for a part of the year, this tenant received a total of LS 45 for his tenancy, and was able to devote all his time and resources to his livestock.

The continued importance of livestock not only to those tenants who have not settled on the scheme, but also to many of those who have, has been clearly demonstrated. Livestock still have an important economic role to play in the life of the scheme, and in this respect the scheme has been unable to effect a complete divorce from the traditional way of life based upon pastoralism. This is not surprising when the economic returns from agriculture are considered, as these do not appear to represent an attractive economic alternative (53). However, the continued importance of livestock in the lives of the people of Khashm el Girba cannot be explained in purely economic terms, for the acquisition of economic power through livestock led and still leads among nomadic groups to the acquisition of political power. The situation is similar in most pastoral societies, as Cunnison observes of the Baggara of central Sudan:

(53) See pages 238-239.

". . . . . the possession of many cattle gave a man a position of authority, whether he wanted it or not". (54)

A similar situation exists among the Shukriya, with the exception that traditionally the camel is the most important animal as opposed to cattle amongst the Baggara. Furthermore, it is unreasonable to expect people whose tribe has followed a particular existence for centuries to give up any connections with that existence in a few years, especially when the traditional existence remains equally attractive in economic terms as the alternative which has been presented to them. Although, therefore, political and social factors may be involved, the continued interests of the population in and around Khashm el Girba in livestock is also based on sound economic grounds, and appears to be a rational adaptation to the newly created situation.

6.4.3 Off-Scheme Cultivation

Closely connected with the pastoral existence in the Butana is the cultivation of rainfed dura, and this is a practice which is also continued by many of the tenants on the scheme, as shown in Table 6.31. The figures presented reveal that this tendency is particularly prevalent in the villages on the western edge of the scheme. This can be explained by the fact that these villages are actually located just outside the agricultural area, so that the cultivation of dura can be undertaken in the villages' immediate vicinity, with the additional advantage of being able to be watered from the Sabir Branch Canal (Figure 6.5). With the villages along the central axis of the scheme no such opportunity exists, so that cultivation has to take place in the plain, a practice which is usually carried out by those owning animals in the Butana, where shepherds can cultivate the crop at the same time as tending their animals. A similar situation

(54) I. G. Cunnison "The Social Role of Cattle". In S. Journ. of Vet. Sci. and An. Husb. Vol. 1, No. 1, March 1960 p. 18.

Table 6.31. Cultivation of dura off the scheme for six selected villages on the scheme.

village	percentage cultivating dura	average area cultivated
Wad Nabar	11.54	11.67
Umrahau	5.88	7.50
New Geili	6.67	20.00
New Reira	16.67	11.25
New Baraysi	57.14	28.33
Arrida Shukriya	48.00	16.08
overall	23.45	19.06

Figures for area are in feddans.

Source: Author's questionnaire survey.

Figure 6.5. Rainfed dura growing between the villages of New Baraysi and Arrida Shukriya on the edge of the scheme.

exists for the villages by the river Atbara, which, although lying off the scheme, are situated on the very uneven and agriculturally unsuitable kerrib land (55).

6.4.4 Conclusion

The contined attention to traditional practices perhaps reflects a certain lack of acceptance of agriculture on the scheme. This may be due to a reluctance on the part of the settlers to completely give up their former way of life and former economic activities, or it may reflect the inability of the scheme to provide a sound economic base for the inhabitants, unless some other source of income is available as a supplement. A similar attitude to the scheme has been observed for the Nubian tenants of the scheme, amongst whom absenteeism and landlordism have developed because:

> ". . . . . the tenants . . . . . through their choice, based upon their opportunity situation, maintain traditional adaptations". (56)

Nor is the situation unique to the scheme at Khashm el Girba, for:

> ". . . . . only a few small tribes mainly in the Gezira, have changed fully from pastoral nomadism to sedentary cultivation. But more have found profit in grafting some form of cultivation onto nomadism". (57)

It has been shown that economic considerations are not insignificant in the decision of many of the settlers on the scheme to retain interests in livestock, or at least to have an alternative source of income, and because of this need, which is largely economic, livestock continue to play an important role in the lives of the inhabitants of the scheme.

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(55) See page 70.

(56) G. Sorbo (b) op. cit. p. 9.

(57) J. H. G. Lebon "Land Use in Sudan", World Land Use Survey, Monograph No. 4, Bude 1965 p. 114.

6.5 The Economic Structure Of The Society

Both examinations of the roles of the rotation and of livestock in the economic lives of the inhabitants of the scheme have emphasised the variation in adaptation and performance to the imposed economic consitions on the scheme. It was concluded that a tenant's performance in agricultural production could be a function of both his willingness to cultivate, and of his economic ability to do so. However, the case of groundnuts, which is the crop requiring the greatest expenditure in its production, suggests that the factor of economic ability may be the more generally important of the 2, for it was concluded that the cultivation of groundnuts was the prerogative, largely, of the wealthier elements of the population, who are the only ones who can afford the large inputs of cash and labour required for the crop's cultivation. Similarly, the ownership of livestock in the Butana was shown to be closely related to a tenant's income, and an underlying economic structure in relation to livestock ownership was hinted at. It is the purpose of this section to expand upon the concept of an economic structure amongst that part of the population which was formerly nomadic.

Although dependence upon the agriculture of the scheme and the utilisation of economic alternatives by tenants operates along a continuum, ranging from complete dependence on the rotation for income, to the extent that animals are kept on the scheme purely for domestic purposes, to almost complete independence of the agriculture of the scheme, whereby a tenant spends no time on his tenancy, but rather rents to other inhabitants of the scheme. It is possible within this continuum, for convenience, to make a general division into 4 types of adaptation to the economic conditions of scheme. These may be stated as follows:

a) Those who have taken a tenancy on the scheme, but whose interests in agriculture are negligible, and who have not permanently settled on the scheme, but who are still primarily interested in livestock rearing.

b) Those who have taken a tenancy and have settled on the scheme, but who still maintain a strong, if not dominant interest in livestock rearing.

c) Those who have taken a tenancy and have settled on the scheme, and are mainly dependent upon agriculture, but who still maintain links with their former existence through the continued ownership of animals outside the scheme.

d) Those for whom the tenancy and settlement on the scheme have meant a break from their traditional way of life based on livestock rearing, and who are completely dependent economically on cultivation on the scheme, keeping just a few animals for purely domestic purposes.

It is possible to relate each of these groupings to a specific economic status within the society, a status which, the arrival of the scheme and settled cultivation, with a few exceptions, has done little to change, the economic conditions of the scheme perpetuating the existing situation. Thus, at the upper end of the scale are those tenants who have wealth and resources sufficient to maintain a dual economy based upon both agriculture on the scheme and the rearing of livestock in the Butana. The emphasis which may be placed on either activity depends very much on individual attitudes, but whatever the attitude, livestock are kept in large numbers and enable a high level of input into the rotation to be achieved, which is the take-off point for the self-perpetuating relationship mentioned earlier (58). The maintainance of large herds suggests that such people maintained large herds before the scheme's inception, for the acquisition of large numbers of animals after commitment to the scheme would require large profits from cultivating the rotation, which, it has been shown, is

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(58) See page 255.

not generally possible unless the resources are already available to afford the necessary level of inputs.

At the lower end of the scale are those tenants whose economic life is totally dependent on agriculture, and who keep only a few animals for domestic purposes. Such tenants, generally, have neither the resources nor the income to sustain an economy based on both cultivation and livestock rearing. At the same time the limited resources available to such tenants do not enable them to afford the required inputs to make agriculture a profitable activity, so that, although they have been introduced into a cash economy, their existence is still very much at a subsistence level. However, not all tenants who have made the complete break from livestock rearing to settled cultivation are at such a level. While those who previously had only a few animals remained poor, those with slightly more animals, who decided to completely change from pastoralism, had sufficient resources to enable them to achieve returns sufficient to put their existence above the subsistence level.

This leaves a wide group of people in the middle, with moderate incomes and resources, and, prior to the scheme, average or slightly above average herds. To such people 2 alternatives were open: they either took up a tenancy while maintaining a primary interest in their livestock, demonstrated through their unwillingness to settle permanently, or they took up a tenancy which formed the main part of their income, while retaining an interest in livestock, though keeping only small herds in the Butana, which served the purpose of a secondary source of income, and also acted as an insurance should the scheme be hit by economic disaster.

In general, therefore, the introduction of the scheme into the eastern Butana has tended to perpetuate the existing economic structure: those who were wealthy before the scheme have been able to maintain their wealth, but the ability of those lower down the economic scale to better their situation

has not been generally improved by the presence of the scheme and the introduction of agriculture. With only a few exceptions, those that were poor before the arrival of the scheme are still poor, and those that were wealthy remain wealthy, if not becoming relatively wealthier.

6.6 Conclusion

In conclusion it can be said that the large proportion of tenants still involved, to a greater or lesser extent, in livestock rearing shows that one of the scheme's aims of changing the settlers' existence from one based on pastoralism to one based on settled cultivation has not been generally achieved. This also implies that, as many tenants feel a need to keep an interest in livestock, the agriculture on the scheme has failed to provide a sound economic alternative to the settlers. Only where tenants already have sufficient resources to afford the inputs required can the rotation become really profitable, so that for the majority of the tenants, to whom such resources are not available, the rotation barely provides an adequate income. Inevitably, exceptions to this occur, but generally agriculture on the scheme has not been able to replace the benefits of pastoralism in economic terms, and has not at the same time, provided the settlers, whose resources are at a low level, with the means by which they can improve. The claim by the administration that this can be attributed to laziness and traditional attitudes is not an adequate explanation. The fact that many settlers feel the need to diversify their sources of income implies that the scheme itself has some inherent economic inadequacies, as such economic adaptation should not solely, or even primarily, be attributed to the settlers' unwillingness to divorce themselves from the traditional existence. It seems more likely that such adaptations are founded upon the settlers' own economic rationality. Such a conclusion is reinforced when it is taken into account that an examination of Nubian economic activity

revealed similar trends (59). Thus, from the settlers' point of view the scheme by itself is not an economic success, but with the adaptations and the diversifications that they have been allowed, and have felt the need to make, a realistic and profitable existence is possible, one which is not running at the subsistence level. This, however, is not true of the poorer strata of the settlers, who cannot afford such diversification, and are, therefore, kept very much at a subsistence level. It is to these elements of the population that the greatest financial help should be made, in the form of favourable loan facilities and more favourable terms under the accounts with the A.P.C.

(59) G. Sorbo (b) op. cit. See also G. Sorbo (a) "On- and Off-Scheme Interests", University of Bergen, Bergen 1972.

CHAPTER SEVEN

SOCIAL ASPECTS OF THE SETTLEMENT

7.1 Introduction

The difficulty of the provision of social services to nomadic groups is frequently cited as one of the reasons for the desirability of settling such peoples. Their very migratory nature makes the provision of such services as education and health very difficult, but if their settlement is effected such obstacles are removed (1). It is the purpose of the first part of this chapter to examine the social aspects of settlement on the scheme in this context, and to this end the following hypothesis was established:

> The settlement of nomadic and semi-nomadic peoples on the scheme at Khashm el Girba has presented such settlers with greater access to social services, and that the existence of such services has improved the social conditions of the population.

The hypothesis will be examined in relation to several different aspects of social conditions separately; viz, housing, education, health and recreation. In the analysis the present situation of the settlers will be compared not only with the situation prior to the establishment of the scheme, but also with the conditions pertaining amongst the Nubian population of the scheme, and also with the Gezira, upon which Khashm el Girba was largely modelled. In a general context the provision of social services has largely taken the form of the construction of schools and medical facilities and the supply of water for domestic purposes, but in addition there is provision within the A.P.C. for more finance to be made available for social services. This

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(1) See pages 59-61.

is effected through the Reserve Fund, which accrues its money from the profits earned by the sale of the cotton crop, of which it takes a 2 per cent share. The actual amounts which have been allocated to this Reserve Fund, thus, vary from year to year according to the level of cotton profits (Table 7.1). The 2 per cent share is deducted from the tenants' 50 per cent share in cotton profits, and can be used not only for improving social services, but also may serve the purpose of an insurance policy in the event of a particularly disastrous agricultural year. This is approaching, though not exactly the same as the situation existing on the Gezira, where "2 per cent of the net proceeds of the cotton crop" is set aside "to finance the various social development activities" (2). This is organised and administered by the Social Development Department of the Gezira Board, and consequently, the Gezira area has an additional body in charge of the provision of social services to the local government councils, to whom the provision of social services is entrusted throughout the rest of the country. With the Reserve Fund at Khashm el Girba a similar situation would be expected to be in existence, but, in fact, the Fund has not as yet been used for any purposes directed at social development, and the provision of social services remains in the hands of the local government council at New Halfa.

7.2 Housing

In the phases of the scheme where the nomads were settled, the provision of housing was restricted to several 'envelope' areas set aside for village development. Aid in relation to individual housing amounted to a grant to

(2) Sudan Gezira Board (b) "Social Development in the Gezira 1950-1960" n.d. p. 13. Since the publication of this pamphlet the proportion of cotton profits given over to the Social Development Department has been increased to 3 per cent. Sudan Gezira Board (a) "The Gezira Scheme - Past and Present" n.d. p. 17.

Table 7.1. Allocation to the Special Fund from cotton profits of the scheme for selected years.

	1965/66	1968/69	1970/71	1972/73
revenue	1,017,430.530	4,927,200.105	5,654,591.829	4,468,293.875
gross profit	372,416.061	1,896,384.511	2,171,596.287	1,570,694.947
net profit	372,416.061	1,896,384.511	2,128,164.362	1,539,281.049
Special Fund 2 per cent share	7,448.321	18,963.845	21,281.644	15,392.810

Figures are in Sudanese pounds.

Source: A.P.C. New Halfa.

the value of LS 9 in the form of building materials. Although the settlement pattern in these 'envelope' areas was intended to follow a prescribed plan, the actual pattern is superficially haphazard (3). This situation contrasts sharply with the position in relation to the resettling Nubian population, for whom the government not only allocated village areas, but also constructed all the individual dwellings. The provision of such housing cost a total of LS 7,789,500 for a total of 7,200 houses (4). In such a situation no scope remained for the use of freewill and initiative by the settlers, as the whole process of resettlement was organised through the government. Although the nature of the scheme at Khashm el Girba was in line with agricultural development in the country as a whole, the provision of housing was an innovation (5), not included on either the Gezira Scheme or the Managil Extension.

Whether such provision is desirable is a debatable question. Although having denied the Nubian population their original homes around Wadi Halfa, the government may have felt a moral obligation to rehouse them, it is possible to argue that:

> ". . . . . from the point of view of settlers' motivation and performance, it is safer to be simple and allow settlers to re-establish themselves in familiar surroundings, if possible building their own houses". (6)

Such a policy was followed in the case of the settling former nomads, and it is the author's contention that allowing the settlers to decide their own type of housing and the arrangement of their own villages, rather than

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(3) See page 134.

(4) I. H. Abdalla "Historical Studies on the Transfer and Resettlement of the Halfa Population at Khashm el Girba" M.A. Thesis, Khartoum 1967 p. 155.

(5) R. J. Chambers (a) "Settlement Schemes in Tropical Africa: A Study of Organisations and Development" London 1969 p. 35.

(6) R. J. Chambers (Ed) (b) "The Volta Resettlement Experience" London 1970 pp. 254-5.

imposing on them a fixed settlement pattern was a less harmful policy. This is maintained for 2 reasons: first, the dwellings constructed are usually similar to those in which they dwelt prior to their settlement on the scheme, being constructed of wooden stakes, mud and raffia (7), and this provides the settlers with some item of familiarity in what was essentially an alien and unknown environment. Second, the very act of constructing their own dwellings is more likely to arouse a sense of identification with a specific location, because the dwelling which they have constructed represents something of permanence, which belongs to them, whereas when the housing is provided by the government there might be a tendency for the settlers not to regard the dwellings as really belonging to them, but on a lease, much as the tenancies are. It is, therefore, suggested that the need to construct their own dwellings has helped the settling former nomads to more easily identify themselves with the scheme.

7.3 Education

7.3.1 Introduction

An examination of education facilities and their utilisation on agricultural settlement schemes must consider 2 aspects: first, the question of academic education, which is usually directed towards children, though adult education programmes should not be ignored; and second, practical education in the techniques required in the occupations of the particular scheme under study. This is usually achieved by the provision of extension services, which at Khashm el Girba are mainly involved in the teaching of agricultural techniques.

7.3.2 Academic Education

The education of the children of nomadic and semi-nomadic groups is a problem which has never been satisfactorily solved. In some instances

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(7) See Figure 4.7.

schools are located in strategic positions - perhaps where a group remains settled for a considerable period of the year - in the hope of attracting attendance at the school for at least part of the year, while elsewhere attempts have been made to provide mobile education facilities, where the teachers move around in accordance with the migratory routes of the group. For example Saudi Arabia uses "mobile schools to follow the Bedouins from one place to another" (8). Settling nomads is one way of overcoming the problem, and should facilitate the provision of education services, and also, consequently, lead to the greater utilisation of such services by the settled population. Relating the scheme at Khashm el Girba to this context the following hypothesis was set up:

> The settlement of nomads at Khashm el Girba has been accompanied by a greater provision of education facilities, and that this has in turn been accompanied by the development of an attitude of more acceptance towards the desire to utilise such services.

The examination of this hypothesis will fall into 3 parts: first, an examination of the provision of education facilities before and after the implementation of the scheme; second, an analysis of changing attitudes towards and utilisation of such services; and finally the situation in relation to adult education will be examined.

7.3.3 The Provision Of Education Facilities

To reach a reasonably accurate picture of the provision of education facilities prior to the implementation of the scheme, it is necessary to refer to 2 principal sources: the First Population Census of the Sudan 1955/56 (9) and the Education Statistics published by the Ministry of

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(8) A. S. Helaissi "The Bedouins and Tribal Life in Saudi Arabia". In I.S.S.J. Vol. II 'Nomads and Nomadism in the Arid Zone' 1959 p. 534.

(9) Republic of the Sudan (1) Ministry for Social Affairs "First Population Census of the Sudan 1955/56" Khartoum 1958.

Education for 1962/63 (10), the year prior to the first settlement on the scheme. The latter source only has figures available at the provincial level, but when used in conjunction with the data from the Census, a reasonably accurate estimate of the situation in the area prior to the scheme can be formed. A summary of education facilities and their utilisation in Kassala Province as a whole prior to the scheme is contained in Table 7.2, which reveals 2 main points: first, there was a marked bias towards male education; and second, that education beyond the elementary stage was limited in both opportunity and extent. In terms of secondary education only 2 facilities existed in the whole of the Province: a boys' school at Port Sudan, and one for girls at Kassala, which only started operation in 1962 (11). Consequently, comparison of the provision of education services will be confined primarily to elementary and intermediate education.

No figures relating to the exact number of schools in the eastern Butana prior to the scheme are available, and had to be estimated using figures from the 2 sources mentioned earlier. Thus, it is estimated that the number of pupils attending elementary and intermediate school between the age of 5 years and puberty constituted 31.91 and 16.41 per cent respectively of those attending elementary and intermediate school in the whole of Kassala Province (Table 7.2). Assuming a constant number of pupils per school, it can be estimated that there were 30 elementary and 2 intermediate schools in Gedaref North Census Area, the area for which the original figures were used. The estimated number of elementary schools proved too high to check through interviews, but in relation to intermediate schools interviews confirmed that 2 existed in the area, one at Khashm el Girba and one at

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(10) Republic of the Sudan (f) Ministry of Education "Educational Statistics: Academic Year 1962-63" Khartoum 1963.

(11) Ibid. p. 52.

Table 7.2. Education facilities and utilisation in Kassala Province and the eastern Butana prior to the scheme at Khashm el Girba, for children between the ages of five and puberty.

	Kassala Province		eastern Butana(1)	
	children attending	no. of schools	children attending	percentage of Kassala Province
elementary	16,278	94	5,195	31.91
intermediate	2,631	14	432	16.41

(1). Eastern Butana is here defined as Gedaref North Census Area.

Figures for eastern Butana come from Republic of the Sudan(1) Ministry for Social Affairs. Population Census Office. First Population Census of Sudan. 1955/56. Khartoum. 1958.

Figures for Kassala Province come from Republic of the Sudan(f). Ministry of Education. Educational statistics: academic year. 1962-63. Khartoum. 1963

Sobagh (12). At this point it should be noted that since the implementation of the scheme the organisation of the education system in the Sudan has been changed, so that intermediate schools have been partially replaced by general secondary schools.

The implementation of the scheme at Khashm el Girba caused a change in the demographic situation of the area, the population becoming both larger and more concentrated into specific locations, but in examining the present situation it is important to remember that a significant proportion of that population is Nubian, and, therefore, the provision of education facilities solely for their use should be ignored from the present analysis. To meet this increased population it was necessary for the government to increase the level of education facilities available. In elementary education the government built schools in selected villages of the Arab area of the scheme to supplement those already existing along the banks of the river Atbara, at such locations as Al Gafalla, Sideira and Goz Regeb. The present location of government-built schools is shown in Figure 7.1, but the extent of elementary education facilities has been further supplemented in certain villages, where the inhabitants have built their own schools through self-help projects (13). Several examples might be mentioned here: New Geili, New Baraysi and Umrahau: in the latter case an elementary school already existed which was theoretically a boys' school, but which also admitted girls - the purpose of the self-help project was to build a separate girls' school. The only other village where a girls' school exists is Al Gafalla, for it is usual for any girls wishing to receive education to attend the boys' schools, probably because the demand for education amongst girls is not usually sufficient to warrant separate girls' schools.

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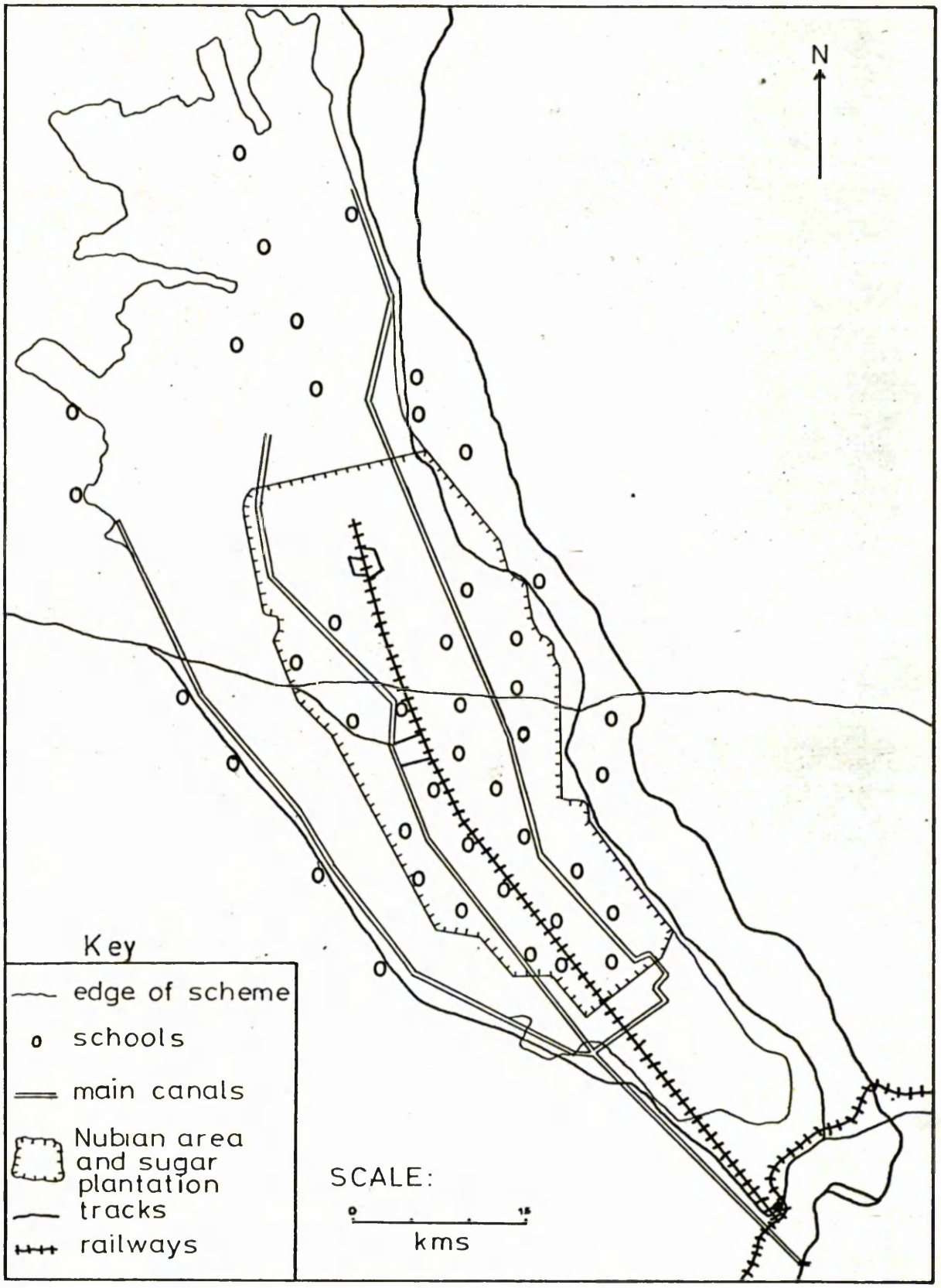
(12) For the location of Sobagh see Figure 4.1.

(13) Self-help will be discussed in greater detail later in this Chapter.

Figure 7.1. Location of schools on the scheme.



In summary, therefore, the area now has 48 elementary schools, a vast increase on the number estimated for the area before the scheme came into existence, but at the same time the increased population has warranted such an increase. A more indicative comparison of the position before and after the scheme is provided by calculating the respective ratios of the number of schools to the total population. Thus, before the scheme it is estimated that there was one elementary school for every 8,333 head of total population, whereas present estimates put the figure at one school for every 3,181 head of total population. This indicates a real increase in the provision of elementary education facilities. However, comparison of elementary facilities provided for the Nubian population is less favourable, for in each Nubian village an elementary school was constructed, so that there are more schools for the Nubian population when the number of Nubians on the scheme is less than the number of settling former nomads. This is reflected in the respective ratios calculated. For the Nubians the ratio of schools to total head of population is 1:1,111 compared with the figure of 1:3,181 for the settling nomads. The overall comparative situation between the Nubian and non-Nubian elements of the population in relation to the provision of social services will be examined later.

Similarly in intermediate and secondary education the Nubians are favoured. Of the 5 new general secondary schools in the scheme only 2 are available for use by the children of the formerly nomadic population. Both these schools, one for boys and one for girls, are situated in New Halfa, and as such are open to children from all elements of the population. Nevertheless, this represents an increase in facilities available, for, prior to the scheme, only 2 schools of equivalent level were to be found in the area, namely at Khashm el Girba and Sobagh. The introduction of a higher secondary school in New Halfa has also made this level of education more readily accessible, although for girls wanting to study at this level

it is still necessary for them to attend the school at Kassala. Higher secondary education of a more applied nature is also available on the scheme in the form of an Agricultural School, also situated in New Halfa, but this is open to students from throughout the Sudan, and not purely from the area of the Khashm el Girba scheme.

Overall, therefore, there has been an improvement in the extent of education facilities provided and available in the area, even when it is considered that a larger more concentrated population has now to be catered for, but it is also necessary to get a wider perspective on the situation at Khashm el Girba. This can be achieved by a comparison of the provision of education facilities in other parts of the country, and particularly on the Gezira, with that at Khashm el Girba. The Gezira is particularly important because it has served very much as the model for Khashm el Girba, and also because it "has been given special attention in the field of social services" (14). Thus, the extent of the provision of educational facilities for selected areas of the country is presented in Table 7.3, which reveals that in Kassala Province the New Halfa area is the best provided area for educational facilities per head of population. However, comparison with areas in the Gezira and the Managil Extension is less favourable, the ratio for New Halfa being consistently higher than those in either of those 2 irrigated areas. Moving into the nomadic areas of Kordofan and Darfur, once again the comparison takes on a favourable aspect. In conclusion it can be said that the introduction of the scheme at Khashm el Girba has improved the availability of educational facilities at all levels in the area, but the extent of that provision is still below its extent in other irrigated areas such as the Gezira and its Managil Extensions. Furthermore, the fact that many villages have, through self-help projects, constructed their own schools, indicates the need for a more extensive provision of education facilities. The

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(14) Sudan Gezira Board (b) op. cit. p. 13.

Table 7.3. The provision of education facilities in selected areas of the Sudan.

rural council	area	no. of facilities	population	population per no. of facilities
N.Gedaref	Kassala	82	249,277	3,040
S.Gedaref	Kassala	53	146,160	2,760
Qala en Nahal	Kassala	17	51,595	3,035
New Halfa	Kassala	43	100,000	2,326
Tokar	Kassala	18	163,939	9,108
Shendi	Northern	121	347,220	2,870
Abu Hugar	Gezira	52	98,612	1,896
El Meilig	Gezira	75	119,098	1,587
El Hasaheisa	Gezira	83	121,098	1,459
Kosti	White Nile	138	301,536	2,185
Dar Hamid	Kordofan	37	140,081	3,787
Dar Kababish	Kordofan	19	177,795	9,357
N.Darfur	Darfur	46	251,358	5,464
S.Darfur	Darfur	78	440,640	5,649

Source: M.O. al Sammani. A study of central villages and their served envelopes as lower order planning units for rural development in the Sudan. African Studies Seminar Series. No. 11. Sudan Research Unit. Faculty of Arts. University of Khartoum. 1971.

provision of these improved facilities may have been one factor in encouraging some of the nomads to settle on the scheme, but to achieve a comprehensive understanding of the position of education in the area, it is necessary to examine the utilisation of the services provided, which is itself an indication of attitudes towards education.

7.3.4 Changing Attitudes Towards Education

Attitudes to education can only really be examined through analysis of attendance at school, and to achieve an indication of changing attitudes over time it is necessary to examine attendance rates for different age groups. Two different sources of data were available for such an analysis: for the period up to 1956 data contained in the First Population Census was available, but for the period since that date, recourse had to be made to information collected through the author's questionnaire survey of 6 selected villages on the scheme.

Examination of the data presented in the 1956 Census (Table 7.4) reveals that the younger the age-group the higher the proportion having undergone education tends to be, perhaps reflecting an attitude of greater desire for education in the area. This trend is particularly discernible for the male population but less so, though still apparent, for the female. Indeed this bias towards male education which has already been mentioned (15), is a phenomenon which is not restricted to this part of the country, but occurs throughout the Sudan (Table 7.5). Thus, prior to the implementation of the scheme 2 elements to attitudes to education can be defined: a trend towards a desire for more education, and a continued bias against the education of girls. The increasing desire for education is apparent not only at the elementary level of education, but at all levels. Thus, the percentage having attended intermediate school was only 0.02 for those over the age of

(15) See page 272.

Table 7.4. Participation in education in Gedaref North Census Area.

level of education		both sexes	male	female
a). five and over to puberty.				
total population:	no.	43,187	24,453	18,754
	per cent	100.0	100.0	100.0
no school:	no.	32,086	15,300	16,788
	per cent	74.3	62.6	89.6
subgrade:	no.	5,472	4,573	899
	per cent	12.7	18.7	4.8
elementary:	no.	5,195	4,157	1,038
	per cent	12.0	17.0	5.5
intermediate:	no.	432	423	9
	per cent	1.0	1.7	0.0
b). over puberty.				
total population:	no.	96,599	49,608	46,911
	per cent	100.0	100.0	100.0
no school:	no.	80,255	36,759	43,496
	per cent	83.1	74.1	92.7
subgrade:	no.	14,406	11,126	3,280
	per cent	14.9	22.4	7.0
elementary:	no.	1,661	1,493	168
	per cent	1.7	3.0	0.4
intermediate:	no.	223	214	9
	per cent	0.2	0.4	0.0
secondary and above:	no.	54	16	38
	per cent	0.1	0.0	0.1

Source: Republic of the Sudan(t). Ministry for Social Affairs. Population Census Office. First Population Census of Sudan. 1955/56. Seventh Interim Report. Khartoum. 1957.

Table 7.5. Literacy in the Sudan.

age-group	male	female	total
10-14	30.4	12.3	21.5
15-19	30.7	5.3	18.1
20-24	30.1	4.0	17.2
25-34	27.6	1.0	14.6
35-44	21.0	-	10.6
45-54	6.5	-	3.2
55 plus	-	-	-
total	23.1	3.5	13.3

Figures represent those literate as a percentage of the total age-group.

Figures are for 1/1/1956.

Source: Republic of the Sudan(f). Ministry of Education. Educational Statistics: academic year. 1962-63. Khartoum. 1963.

puberty, but had risen to one per cent for those between the ages of 5 and puberty.

To examine how these attitudes have changed or developed since 1956, and since the scheme's inception, it is necessary to refer to data collected in the author's questionnaire survey of 6 selected villages on the scheme. For the purposes of comparing attitudes over time the population was divided into 4 age-groups: from 7 to 13; from 14 to 19; from 20 to 30; and from 30 upwards. Some explanation needs to be given for the choice of these divisions: the first 2 coincide with the ages of pupils attending elementary and some form of secondary school respectively, and together go back as far as the beginning of the scheme, in that those aged 19 would have begun schooling, at the age of 7, 12 years ago in 1963, at which time the scheme was just beginning. The final 2 age-groups were decided arbitrarily. The results of the analysis are summarised in Table 7.6, which reveals that the percentage of the population with no education increases with the age of that population, indicating that education facilities have been utilised to a greater extent by more recent generations. These observations apply equally to girls' as to boys' education, but the proportion of girls educated still lags far behind the proportion for boys, indicating a continued bias against girls' education, although such an attitude is gradually being eliminated. This bias is further reflected by the presence in the area inhabited by former nomads of only 2 schools directed specifically towards the education of girls, namely at Umrahau and Al Gafalla. The table also shows, however, increased education which means increased use of facilities and with it an increased demand for more facilities. This is reflected in the fact that many villages where no school was built for the inhabitants by the government, have managed to provide themselves with schools with the aid of self-help projects, and even in villages where schools were provided self-help projects have often helped to extend the

Table 7.6. Participation in education at Khashm el Girba.

age-group	7-13	14-19	20-30	30 on	7-13	14-19	20-30	30 on
no education	11.37	21.43	39.77	69.47	57.95	81.31	84.00	98.53
elementary education only	88.43	37.50	38.20	15.27	42.05	16.67	12.00	1.47
elementary and secondary education	88.43	78.57	58.43	18.32	42.05	18.52	13.33	1.47
secondary education only	n.a.	41.07	20.23	3.05	n.a.	1.85	1.33	0.00

Figures represent percentages of the age-group concerned.

Source: Author's questionnaire survey.

facilities available by building extensions, classrooms and sleeping quarters for the teachers.

But such developments and attitudes refer largely to elementary education, while in secondary education certain differences are discernible. For the male population the situation is similar to that existing at the elementary level: an expansion of utilisation of secondary educational facilities can be seen, albeit occurring at a lesser level than in elementary education. Over 40 per cent of the population interviewed in the 14-19 age-group - the ages between which secondary education usually takes place - had received or were receiving some form of secondary education, and this constitutes over half of the proportion of the population of that age-group which had received elementary education. If this proportion is compared to that for the age groups above, where those receiving secondary education constitute approximately 30 per cent and 16 per cent respectively of the peoples of the age-group who received elementary education, the trend for greater participation in secondary education becomes more apparent, and particularly so since the beginning of the scheme. These figures refer to all levels of secondary education, however, and it is possible that the utilisation of higher secondary education facilities is not quite so extensive. Indeed, out of just under 500 pupils at the Higher Secondary School in New Halfa, only 20 came from the non-Nubian areas of the scheme (16), which appears to prove that the desire for higher secondary education is not so great.

Female participation, however, in secondary education at any level is extremely limited, and does not appear to be expanding significantly. Of the age-group 20-30 only 1.33 per cent had received any form of secondary education, but the figure had only risen to 1.85 per cent for the age-group

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(16) Personal communication: Headmaster at New Halfa Higher Secondary School.

14-19. Attitudes to this level of education appear, therefore, to have changed very little with regard to the female proportion of the population.

Changes in attitude and greater utilisation of education facilities have been noted for boys' education at all levels, and for girls' education at the elementary level, but it is possible, and indeed indicated by the data contained in the 1956 Census, that these changes are merely part of a general trend, and that, therefore, the presence of the scheme in the area has not been a significant factor. However, it has already been noted that there has been a significant increase in the proportion of boys undertaking secondary education for the age-group affected by the presence of the scheme, compared to the age-group eligible for secondary education prior to the scheme. A similar situation appears true of boys' elementary education, for both age-groups over which the scheme might have been expected to have had a significant effect - the 7-13 and the 14-19 age-groups - show very high rates of attendance, approaching and even exceeding 80 per cent. In relation to girls' elementary education a sharp rise in the proportion participating can also be discerned between the age-group 7-13, and the 14-19 age-group. Between the latter of these groups and the one above it, however, no significant difference in participation is apparent. There, therefore, appears to have been a time lag between the start of the scheme, and the greater utilisation by girls of the education facilities available. This lag may be due to difficulties in breaking down inhibitions towards and barriers against female education, barriers and inhibitions which were not so apparent amongst the male population, and therefore, which required little or no time to break down.

The presence of the scheme, together with its increased educational facilities appears to have encouraged a greater utilisation of these facilities, and helped foster a desire for education amongst the settling former nomads on the scheme. Although such a trend was already discernible

prior to the establishment of the scheme, this trend seems to have been reinforced with the presence of more extensive facilities, although certain inhibitions against female education still seem to persist.

7.3.5 Adult Education

Adult education, outside the field of extension work, which will be examined in the next section, is at present minimal, if not non-existent on the scheme. Attempts were made in the early stages of settlement to educate the illiterate members of the population and although the scheme lasted for a year, it was a failure due to the lack of interest shown by the settlers. The scheme at Khashm el Girba falls far behind the Gezira in this respect. On the Gezira, in each of 4 group areas - Southern, Central, Messelemia and Wad Shair - there is one senior adult education officer and 4 resident adult education officers, while in the North and North-West group areas there are 9 local adult education officers (17). In Khashm el Girba this is perhaps one field of education in which facilities could be extended, and lessons taken from the Gezira. Though attempts may have failed in the early years of the scheme, perhaps now that the population has been settled for a few years it will be more responsive to any further attempts.

7.3.6 Practical Education

For a group of people either settling in a completely alien environment, such as the Nubians, or being required to adapt to strange agricultural practices and techniques, such as the former nomads settling on the scheme, the provision of adequate and efficient extension services is essential. At Khashm el Girba the provision of such services is the responsibility of the A.P.C., who operate the services through 2 departments: the Field Department, which is responsible for the supervision of work in the field, tenants' work and dealing with accounts; and the Extension Department,

(17) Sudan Gezira Board (b) op. cit. p. 20.

whose function is the education of the tenants and the dissemination of information on agricultural techniques. The organisation of extension work is carried out under 5 sections, 3 of which are located in the non-Nubian areas of the scheme: at Kilo 65, which deals with the western area of the nomadic settlement on the scheme; at Saba'at, which concentrates on the central portion of the non-Nubian area; and at Umrahau, which deals with the eastern portion. Each section is further subdivided into blocks, which number 19 throughout the scheme. Twelve of these blocks are situated in areas where nomadic settlement has taken place, 3 being located in the Umrahau section, 4 in the Saba'at section, and 5 in the Kilo 65 section. The actual provision of extension services is directed from the section headquarters, and dispersed through the various blocks. It tends to take 2 main forms: in each block there is one demonstration plot of 15 feddans, growing each crop in the rotation - this may be a specifically designed area tended by the block officials, or, occasionally, a particularly successful and efficient tenant's land may be chosen to serve the function of a demonstration plot. In return for allowing his tenancy to be used in this way the tenant concerned usually receives some remuneration, frequently in the form of free fertiliser or free seed. The purpose of such plots is to demonstrate to the tenants how best to make use of his available resources, through correct planting procedures, efficient watering and regular weeding and tending. The existence of these demonstration plots is supplemented by periodic visits made by extension and field officers to individual tenants. These occur, at the most, twice a year, and do not usually last for more than 3 hours, so that the sum total of an individual tenant's contact with officers whose purpose it is to educate him as to efficient agricultural techniques and practices, may be no more than 6 hours during one whole year. Such an allocation of time appears grossly inadequate, even given the constraints of qualified manpower and transport, both of which are in short

supply on the scheme. Interviews with tenants suggested that they felt the need for more supervision and guidance in the cultivation of the crops in the rotation.

To achieve a wider perspective on practical education and extension services on the scheme, it is necessary to examine the situation existing on the Sudan's other major agricultural scheme - the Gezira - and compare their respective positions. Obviously being a much older scheme, the Gezira has had more time to develop its extension services, but nevertheless the scheme at Khashm el Girba should be able to utilise and learn from its experience. Apart from the normal extension services in operation on the Gezira, which are organised on similar lines to those of Khashm el Girba - demonstration plots and visits from extension officers - perhaps the most important aspect of extension work on the scheme has been the development of 2 training farms for the sons of tenants. All the boys:

> ". . . . . are resident pupils who in the course of one year's period of intensive training are taught how to work as skilled hands on their father's farm. Each of them is entrusted with the tillage of a small plot, the accounts of which have to be kept with meticulous care. A wide scope is also given to livestock rearing: each boy is the owner of a goat". (18)

The success of such a policy is reflected in the fact that only 10 per cent of the pupils who have found employment have done so outside agriculture. Such an innovation would be of benefit to the scheme at Khashm el Girba, especially as the tenants on the scheme are unused to the agricultural techniques they are required to practice. Indeed, the provision of practical education in general on the scheme, although it does not compare unfavourably with the Gezira, appears to need expansion, so that the tenants are given more tutelage into the necessary techniques for efficient cultivation.

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(18) G. H. van der Kolff "The Social Aspects of the Gezira Scheme in the Sudan", Royal Tropical Institute, Dept. of Cultural and Physical Anthropology, Amsterdam 1957 p. 41.

7.4 Health

7.4.1 Introduction

The health situation amongst nomadic groups in the Sudan as a whole has been attributed to 3 main factors:

"a) The nature of nomadism in the Sudan and the marginal areas they occupy, their remoteness from service centres and inaccessibility.

b) The low level of nomadic participation in the process of social change, and their general unawareness.

c) The general ignorance and underestimation of the nomadic socio-economic needs by the authorities that resulted in many misachievements in their social and economic progress". (19)

But perhaps the main criticism levelled at nomads in terms of health hazards is that they provide:

". . . . . serious means of disseminating disease from one place to another. Even when these nomads and pastoralists congregate near water resources during the dry season they create serious health problems due to overcrowding, lack of sanitation, proximity to animal refuse. Such conditions accelerate the breeding of flies, mosquitoes, ticks and other insects". (20)

Thus, nomadic societies would appear to be serious health hazards, and therefore, their settlement desirable in terms of reducing such hazards and making the provision of facilities for them easier. In this context the hypothesis of this section was established as follows:

The settlement of nomads at Khashm el Girba has been accompanied by a greater provision of health facilities, and that this has resulted in the health conditions of the population concerned being improved.

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(19) A. J. Abdalla "Health Problems of Nomads in the Sudan: An Administrative Viewpoint", Ministry of Local Government n.d. p.2.

(20) A. T. Sharaf "A Geographical Assessment of Health Problems and Disease Incidence in the Sudan", a summary of the original paper presented to the International Geographical Congress, held in New Delhi, December 1968 p. 2.

In examining this hypothesis the nature and extent of the health facilities will be considered, both before the implementation of the scheme and after it. Then the main diseases present on the scheme will be discussed, together with the measures taken to control them, and finally general factors affecting health conditions on the scheme will be discussed.

7.4.2 Health Conditions Before And After The Implementation Of The Scheme

Few records exist as to the health situation in the area prior to the introduction of the scheme, but there are some indications of the prevalent diseases. Kala azar, for example,

> ". . . . . occupies the forefront among endemic diseases in the 3 provinces of Blue Nile, Kassala and Upper Nile". (21)

and the same source notes that the disease was firmly established in Gedaref district. Of other diseases around the region, malaria appears to have been the most common, the area along the River Atbara being considered mesoendemic, while,

> ". . . . . an average annual parasite rate of 28.8 per cent was recorded amongst the riverine population, with a seasonal malaria peak in October". (22)

Other prevalent diseases include plasmodium falciparium and plasmodium vivax (23).

For the provision of health services records only exist for the province of Kassala as a whole. Thus in the year 1964/65, at the scheme's inception, there were estimated to be 7 hospitals, 13 health centres, 54 dispensaries

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(21) I. A. Hussein "The Problem of Health in the Sudan". In 'The Health of the Sudan: A Study in Social Development', Procs. of the Phil. Soc. of Sudan, Eighth Ann. Conf. Khartoum 1963

(22) Khashm el Girba malaria control project: summary notes prepared for the visit by Dr A. V. Richardson, Consultant in Endemic Diseases, Ministry of Health, 8-15 June 1969, umpublished, p. 2.

(23) Ibid. p. 2.

Table 7.7. The provision of health facilities in selected areas of the Sudan.

rural council	area	no. of facilities	population	population per no. of facilities
N.Gedaref	Kassala	52	249,277	4,794
S.Gedaref	Kassala	49	146,160	3,400
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New Halfa	Kassala	29	100,000	3,448
Tokar	Kassala	6	163,939	27,326
Shendi	Northern	41	347,220	8,469
Abu Hugar	Gezira	21	58,612	4,696
El Meilig	Gezira	33	119,098	3,609
El Hasaheisa	Gezira	24	121,098	5,046
Kosti	White Nile	52	301,536	5,798
Dar Hamid	Kordofan	18	140,081	7,782
Dar Kababish	Kordofan	16	177,795	11,112
N.Darfur	Darfur	21	251,358	11,969
S.Darfur	Darfur	40	440,640	11,016

Source: M.O. al Sammani. A study of central villages and their served envelopes as lower order planning units for rural development in the Sudan. African Studies Seminar Series. No. 11. Sudan Research Unit. Faculty of Arts. University of Khartoum. 1971.

and 89 dressing stations throughout the province (24). Interviews suggested that, of these facilities, only a few were to be found located in the area of the eastern Butana, usually situated at traditional tribal centres such as Sobagh, Al Gafalla, Umrahau, Goz Regeb and Khashm el Girba. Although no definite statistics as to the extent of health facilities can, therefore be given for before the implementation of the scheme, since that time the extent of facilities appears to have increased considerably, for outside the Nubian area of the scheme 5 dispensaries and 12 dressing stations are now to be found, the locations of which are shown in Figure 7.2. In addition, 3 other larger scale facilities are available in the vicinity of the scheme: a medical centre was established at Khashm el Girba; a main hospital was built in New Halfa; and a rural hospital was built in Massna (25). As was the case for education facilities, however, the Nubian population has been far more comprehensively supplied with health facilities. Each Nubian village has some form of medical facility, there being in all 5 health centres, 5 dispensaries and 15 dressing stations (Figure 7.2). In terms of the ratio of facilities per head of population the respective figures for Nubian and non-Nubian populations are 1:1,071 and 1:3,500 respectively. A wider perspective is achieved in comparing the ratio for the New Halfa area with those for other parts of the Sudan (Table 7.7). This reveals a similar situation to that existing in relation to education facilities: the comparison with much of Kassala Province is very favourable, as it is with the nomadic areas of Kordofan and Darfur, but in relation to the Gezira the situation is different for health facilities as opposed to

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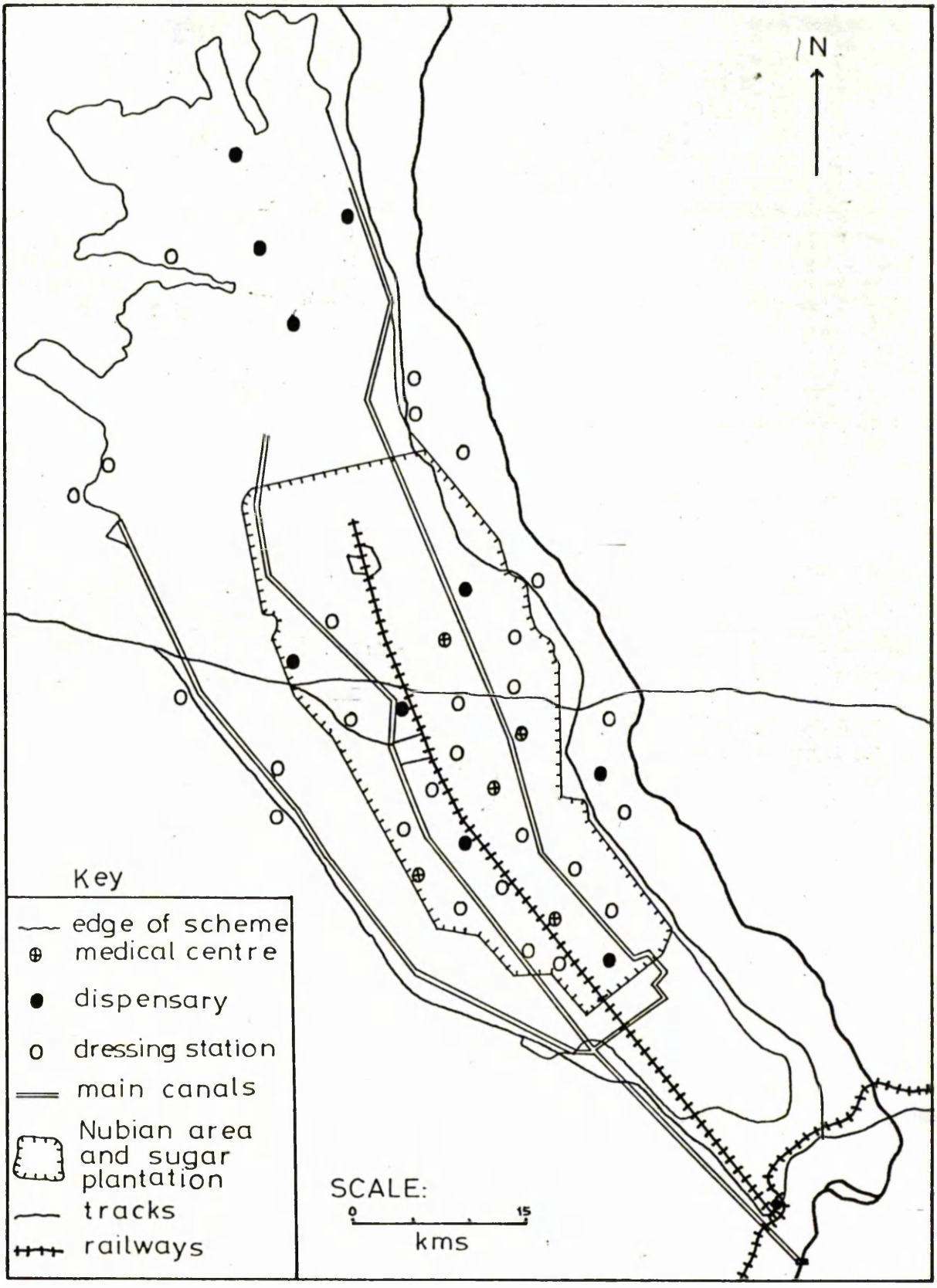
(24) Republic of the Sudan (k) Ministry of Planning, Department of Statistics, Statistical Abstract 1970, Khartoum 1970 p. 9.

For the difference in facilities provided at these centres see Appendix J.

(25) Personal communication: Health Department, New Halfa.

Figure 7.2. Location of medical facilities on the scheme.



those for education. Whereas for education the ratio of the number of people per facility was generally higher for New Halfa (26), in terms of health facilities the comparison is much more favourable, the ratio for New Halfa being similar to and even less than the ratio for parts of the Gezira.

That the provision of more health facilities has taken place in the area is apparent, but in this respect the Nubian population has again been served better than the former nomadic population. It is now necessary to examine whether the presence of greater facilities has improved the health conditions of the population. Although nomads have themselves been criticised for constituting a serious health hazard, it is also true that the presence and implementation of such schemes as that at Khashm el Girba:

> ". . . . . are associated with serious health hazards. The expansion of irrigation schemes, for instance, has added in the last few years extensive areas in which bilharzia, ancyclostomiasis, malaria and other diseases have established themselves". (27)

At Khashm el Girba the 2 main diseases to have arisen due to the introduction of irrigation appear to be malaria and bilharzia, although malaria was already mesoendemic in the area prior to the scheme's implementation (28). It is proposed now to examine the extent of each of these diseases and the measures and facilities available to control them.

7.4.3 Malaria

The existence of the disease in the area prior to the implementation of the scheme meant that, at its very inception, measures were in hand to keep the disease under control, particularly in relation to the Nubian population who were coming from a vector-free zone, and as such were non-immune. Consequently, a malaria control project was established whose

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(26) See page 278.

(27) A. T. Sharaf op. cit. p. 2.

(28) See page 290.

duties were divided according to the origins of the settlers. Thus, the Nubians received extensive prophylactic treatment before their arrival at the site, treatment which was not available to the settling former nomads of the area who, it was considered, already possessed a certain degree of natural resistance to the disease, being native to the area. Both groups, however, are protected by the other disease control measure adopted, namely the bi-annual spraying of selected households with D.D.T. to control the numbers of mosquitoes. This programme began in 1964, and involves spraying, at the level of 2 grams, in June and mid-October (29). In addition to this there is regular application of endrin and organo-phosphorus compounds to the cotton crop to further control the vectors of the disease. These measures have not, however, been wholly successful in keeping the disease under control, for a steady increase in the number of cases up until 1970 is discernible (Table 7.8). This trend appears to have been checked since that time, but 1974 again shows an increase in the number of cases observed. This recent increase is easily explicable, because in 1974 administrative and supply difficulties prevented the necessary spray from being transported from Khartoum to New Halfa, which highlights the need for continuous measures to keep the disease in check, for any lapse in these measures soon leads to an advance on the part of malaria.

In spite of the measures taken to control the disease, malaria remains the most common disease on the scheme. This is reflected in the findings of the author's questionnaire survey of 6 selected villages, where of those complaining of having suffered from illness during the previous year, usually over 70 per cent gave that illness as malaria (Table 7.9). The incidence of the disease is markedly seasonal with a peak during October (Table 7.10), although for the rest of the year the fluctuations are not

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(29) Khashm el Girba malaria control project, op. cit. p. 1.

Table 7.8. The incidence of malaria on the scheme.

year	no. of cases
1966	670
1967	1390
1968	1310
1969	2380
1970	2830
1971	2013
1972	1745
1973	1218

Source: Health Department. New Halfa.

Table 7.9. The incidence of malaria in six selected villages on the scheme.

village	malaria cases
Wad Nabar	78.05
Umrahau	76.12
New Geili	68.18
New Reira	71.03
New Baraysi	73.81
Arrida Shukriya	79.84
overall	75.29

Figures are the people complaining of having suffered from malaria in 1973/74 as a percentage of the total number of people complaining of having suffered from any disease.

Source: Author's questionnaire survey.

Table 7.10. Monthly incidence of malaria on the scheme in 1974.

month	no. of cases
January	133
February	78
March	136
April	163
May	109
June	92
July	48
August	243
September	71
October	808

Source: Health Department. New Halfa.

great. The predominance of occurrence during October can be explained by several factors: first, in October it is still the end of the rainy season, with the result that the incidence of standing water and moist conditions, the breeding grounds of mosquitoes, is high. Although the same is true from late June till September, the June spraying of D.D.T. limits the extent of the mosquitoes. Similarly, after mid-October, when the second spraying takes place, incidence is again controlled to a greater extent, hence accounting for the fall off in the incidence of the disease after October. Indeed, in the riverain area after October chest complaints become more common than malaria (30).

The malaria control project is faced with several major difficulties in its attempts to keep the incidence of the disease down: problems of supply of the necessary materials, which were particularly exacerbated during 1974, constantly hinder the programmes implementation and as a result the extent of the area that can be sprayed is limited, with the consequence that only a sample of households can be treated. Although the cotton crop is regularly sprayed, one of the main breeding grounds for malarial mosquitoes is largely inaccessible, that is the considerable area, amounting to some 45,000 feddans, devoted to the sugar plantation. In view of such problems, it seems unlikely that malaria will ever be completely controlled on the scheme, and will, therefore, continue to constitute one of the scheme's main problems.

7.4.4 Bilharzia

Bilharzia has so far been a less serious problem than malaria, the incidence of the disease being comparatively low - the total number of cases during the first 10 months of 1974 was 109 compared with a total of 1,911 for malaria (Table 7.11). Although no figures for the yearly

(30) Personal communication: Health Department, New Halfa.

Table 7.11. Monthly incidence of bilharzia on the scheme in 1974.

month	no. of cases
January	18
February	5
March	3
April	5
May	8
June	15
July	12
August	17
September	11
October	15

Source: Health Department. New Halfa.

incidence of the disease were available, figures relating to the number of snails found indicate a significant trend of increase (Table 7.12), suggesting perhaps that the disease is likely to become a more serious problem. The control measures for bilharzia are restricted mainly to the application of copper sulphate to the canals, but of 104 canals extending across the scheme, only about 50 per cent are as yet covered by the control programme. Furthermore, this treatment affects only the living cells, and leaves the eggs untouched. Although periodic clearance of eggs from the canals takes place, these services are at the moment restricted to Phases I and II of the scheme (31), and, therefore, does not concern the majority of the settling nomads who are predominantly settled in Phases III to V. This increase in the presence of bilharzia and bilharzia carriers contrasts with the situation existing prior to the implementation of the scheme, when, although snails were present in the River Atbara, there were no reported cases of the disease (32). The present situation in the non-Nubian area is not assisted by the nature of the water supply for domestic purposes. In the Nubian area domestic water is supplied by pipe to the individual dwellings after passing through a water filter from the main canal. This arrangement obtains in every Nubian village, but the extension of such provision for the inhabitants of the non-Nubian area is limited to certain villages only, whose location is shown in Figure 7.3, so that domestic water has to be taken directly from the canals, or, in the case of villages by the Atbara, from the river itself. As such places are the breeding grounds for the bilharzia snail, the danger of using such a water supply is obvious, especially as the clearance of eggs is restricted to the areas which have an adequate domestic water supply, namely Phases I and II. Thus, the extension of adequate

(31) Personal communication: Health Department, New Halfa.

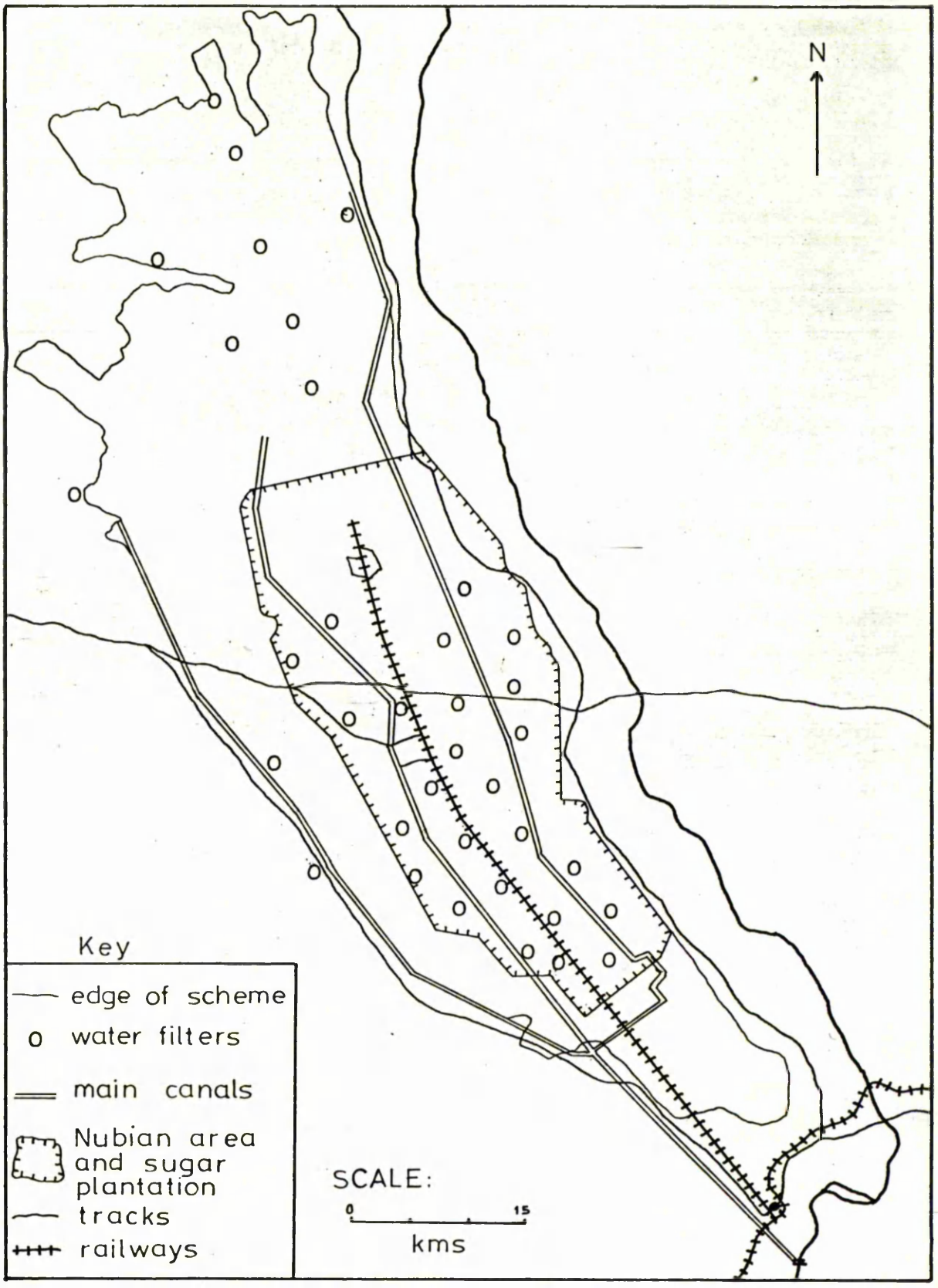
(32) Personal communication: Health Department, New Halfa.

Table 7.12. The incidence of bilharzia snails found in the canals of the scheme. 1965-1973.

year	no. of snails found
1965	1,014
1966	3,101
1967	4,712
1968	5,841
1969	16,160
1970	21,788
1971	26,816
1972	27,882
1973	23,197

Source: Health Department. New Halfa.

Figure 7.3. Location of water filters on the scheme.



domestic water supply to all villages on the scheme, through the construction of water filters, is an essential step in attempting to control the disease. However, as with malaria, it appears that the resources at present available to attempt to control bilharzia are insufficient to keep the disease in check, and there is clearly a visible trend in the increase in the number of snails present in the canals to suggest that the disease is likely to increase in incidence in the future.

The experience of the scheme at Khashm el Girba in relation to malaria and, particularly, bilharzia is similar to the experience of the Gezira scheme, where in recent years bilharzia has become a particularly serious problem. There, too, the problem was exacerbated by the use of water from the canals, for:

> ". . . . . the old wells completely fell into abeyance, once the irrigation canals had brought the water within easy reach of the population". (33)

Control measures of both bilharzia and malaria follow similar lines to those at Khashm el Girba, with the treatment of the canals with copper sulphate for bilharzia, along with the construction of deep wells and water filters, and the spraying of houses with insecticides for malaria. But as at Khashm el Girba, these control measures seem insufficient to keep the disease in check. Thus, Khashm el Girba has been able to learn little with respect to disease control from the experience of the Gezira scheme, and the proposed Rahad scheme appears likely to follow the same pattern, as the canalisation system is to be identical, with no attempts to line the canals, which would make the control of the bilharzia snail easier. It seems likely, therefore, that not only on the scheme at Khashm el Girba but on irrigation schemes in general in the Sudan the twin disease problem of malaria and bilharzia will continue to be serious and require concentrated and constant attention.

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(33) G. H. van der Kolff op. cit. p. 41.

7.4.5 General Factors Affecting Health Conditions On The Scheme

Although malaria and bilharzia are the main diseases present on the scheme, other ailments do occur, particularly in the form of chest complaints. Several factors can contribute to the general health standards of the settled population of the scheme, such as the provision of domestic water supply, the dietary conditions, and contacts with other elements of the population, in which respect immigrant seasonal labour is particularly important.

a) Provision Of Domestic Water Supply. The importance of a good domestic water supply was already mentioned in connection with bilharzia, but the utilisation of water direct from the irrigation canals can lead to infections other than bilharzia, such as dysentry, which have a debilitating effect on the population, and help to reduce their effectiveness and ability to perform their necessary duties. In unfiltered water the dangers of contracting such an infection are greater than in filtered water, and as it is in the areas where nomads were settled that the provision of water filters does not cover the whole population, it is this proportion of the settlers on the scheme that are most affected.

b) Dietary Conditions. An adequate diet is necessary in 2 respects: first, if a diet is not adequate, the ability of an individual to resist infection is lowered; and second, an adequate diet gives an individual sufficient energy to perform the duties he is required to do. Recognising the necessity, the government enlisted the help of the United Nations in providing the settling nomads with food aid. This extended over the first 3 years of nomadic settlement, before being discontinued, and consisted of dura, milk, vegetable oil and sugar (34). U.N.I.C.E.F., however, continued the provision of food aid to children. This was effected by supplying all

(34) Personal communication: Health Department, New Halfa.

the schools in the Arab area of the scheme with breakfast, which consisted of milk, bread and sardines, designed to provide protein; this aid continues to the present day. For the majority of the population, however, such food aid is now not available, and the diet pursued by the settlers is essentially similar throughout the scheme, consisting of a dura-based element usually served with some form of 'soup', made either from a milk or a meat base. Other elements may include beans, cheese, tomatoes and lettuce, and the whole is occasionally supplemented by meat. Also staple to the diet of the inhabitants are the frequent cups of tea and coffee, which are liberally supplied with sugar. Such a diet is both filling and not lacking in nutritional value, although it has been noted in relation to the scheme at Gezira that:

> ". . . . . the transition from a nomadic to a sedentary way of life is readily accompanied by a deterioration of the diet in respect of animal ingredients". (35)

Whether this need necessarily be true of Khashm el Girba is, however, debatable, especially as a significant proportion of the population still retain their interests in livestock rearing (36).

c) Seasonal Immigrant Labour. The demand for seasonal labour on the scheme is large, particularly from December through until March, which is the harvesting season. In addition, the sugar plantation employs some 5,000 seasonal labourers to harvest the sugar crop (37). Coming from such areas as Kordofan, Jebel Marra and the Gezira, such migrant population is liable to carry many infections, and health officials noted that, particularly with regard to bilharzia, but also in relation to other diseases, incidence tends to vary according to the presence of migrant labourers within the scheme.

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(35) G. H. van der Kolff op. cit. p. 60.

(36) See page 251.

(37) Personal communication: Manager of the sugar plantation, Massna.

7.5 Recreation

The provision of recreation facilities on the scheme is confined largely to the town of New Halfa, where, apart from the numerous cafes - the centres of discussion - there are 2 cinemas. Outside New Halfa, and to a lesser extent Massna, no such recreational facilities are provided, but the lack of electricity means that none are required. However, it is in the provision of sports facilities that a marked lack is apparent, for such facilities as football pitches and basketball courts are confined in the main to the schools of New Halfa. The situation on the scheme is, in both respects, inferior to that pertaining on the Gezira: thus, in addition to a cinema at Wad Medani, there are 2 mobile cinemas operating, run by the Social Development Department, which give both educational and recreational film-shows. The popularity of such a service is illustrated by the figures for 1959/60 when 272 shows were given and these were attended by 115,665 villagers (38). In the field of sport basketball, table-tennis and football are all popular and well-provided for. For example, by 1960 there were 113 sports and social clubs on the scheme, and in addition, there were 370 football teams with a total membership of 11,108 players. Such clubs and teams are given some small financial help by the Social Development Department for equipment, light furniture and books (39). This comparison of recreation facilities between the Gezira and Khashm el Girba shows that there is some considerable scope for improvement at Khashm el Girba.

7.6 Summary

Just as the priority of the allocation of tenancies on the scheme was directed towards the incoming Nubian population, so the provision of social services to the Nubian population was more comprehensive than that for the

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(38) Sudan Gezira Board (b) op. cit. p. 31.

(39) Ibid. pp. 30-31.

settling nomads. For the latter proportion of the population it has been noted that:

> "Public services such as water supplies, health, security and education were provided. These, however, fall short of the requirements of the settlers". (40)

In the Nubian area such facilities for health, education and domestic water supply were provided for each village, but their allocation in the non-Nubian areas was less extensive, not all villages being supplied with a water filter, and health and education facilities being located in only selected villages. In view of this comparative situation resentment on behalf of the settling nomads is understandable, but it should be stressed that the situation now existing on the scheme is superior to that in existence before the scheme was implemented. That is not to say that the provision of better facilities automatically improves social conditions, for, although in the field of education figures suggest a trend towards greater participation, in regard to the health situation greater facilities have been necessary to combat the threat of greater incidence of disease, posed particularly by malaria and bilharzia. Comparison with the Gezira also reveals certain deficiences, particularly in the educational field, where the number of people per educational facility is higher at Khashm el Girba, and where also the provision of extension services and technical advice appears to require some expansion.

Nevertheless, the settlement of nomads on the scheme has certainly facilitated the provision of improved social services by the Government. Furthermore, in the educational field, utilisation of facilities has shown

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(40) M. Y. Sukhar and M. H. el Jack "Mass Resettlement of the Population of the Lands Flooded by the Aswan High Dam: A Socio-Economic Appraisal of the Resettlement of the People of Wadi Halfa at Khashm el Girba Agricultural Scheme". In Papers presented to the National Conference on Human Environment and Development, held 5-12 February 1972, Khartoum 1972, p. 43.

an increase since the scheme's inception. In relation to health, although such diseases as malaria and bilharzia are more common, the treatment of disease is more readily available. Although, therefore, social problems still remain, the settled formerly nomadic population appear to be better off socially than before, and furthermore, perceive themselves to be better off.

7.7 The Organisation Of Local Politics And Administration

7.7.1 Introduction

Political considerations may be one set of factors behind the desire to settle nomadic groups, for it is undoubtedly easier to administer and extend the forces of law and justice to a settled population than to a migratory one. Nevertheless, settlement, because it involves permanence and prolonged proximity, can lead to greater communication and discussion within a group, resulting in the easier co-ordination of local political activity. In this context the following hypothesis was established:

> The settlement of nomadic and semi-nomadic peoples on the scheme at Khashm el Girba has facilitated the greater involvement of the population in local politics, and also the better organisation of that involvement.

This hypothesis will be examined in 3 parts: first, local political organisation will be examined in relation to local administration; second, the other bodies of a political nature which have developed on the scheme will be examined; and finally the methods by which these bodies operate, and their importance to the development of the scheme will be discussed.

7.7.2 Local Political Organisation

During the period of British rule under the Anglo-Egyptian Condominium, the organisation of local politics and local administration became fixed largely upon the existing power structure within groups, particularly within nomadic groups. This structure, however, varied from group to group. Thus amongst the Kababish, communication between the government and the tribe was

conducted by the Nazir, who was invariably a member of the Awlad Fadlallah (41). Practically all the political power within the Kababish tribe was confined to the Nazir and his family, a situation which developed during the strong reign of Sheikh Ali at Tom during the nineteenth century (42). Routine administrative duties, such as the collection of taxes were delegated from the Nazir to tribute sheikhs, who, however, had little opportunity to create for themselves a position of political power:

> ". . . . . the section sheikh is essentially an official who acts as a tax collector and communicator between Nazir and tribesman. He cannot resort to legitimate coercion to enforce his authority - still less to extend his personal power for political purposes. His office is personally lucrative and prestigious, but neither wealth nor prestige provide him with an adequate basis for the exercise of political leadership". (43)

Thus, amongst the Kababish, power has become instituted in one particular family, and no hierarchy has been allowed to develop.

Amongst the Baggara, however, the presence of the Anglo-Egyptian Condominium worked in the same way but to a different end. The Government institutionalised the power structure of the tribe by recognising groupings within the whole, and allotting to these groupings either nazirates or omdaships depending on their size. The Government, thus:

> ". . . . . picked out agnatic divisions and gave them a rigidity and value they had not had before; and for administrative purposes these became the only divisions recognised". (44)

While such positions of power are not definitely fixed to particular family groups, as they are amongst the Kababish, in the majority of cases power does pass within the family structure.

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(41) T. Asad (a) "The Kababish Arabs: Power, Authority and Consent in a Nomadic Tribe", London 1970 p. 158.

(42) Ibid. p. 158.

(43) Ibid. p. 154.

(44) I. G. Cunnison (a) "Baggara Arbas: Power and Lineage in a Sudanese Nomad Tribe", Oxford 1966 p. 137.

> ". . . . . the Government, while saying that it did not necessarily hold to the hereditary principle in Nazirates, showed a preference, so long as there were suitable men in the family concerned, to replace office-bearers by kinsmen". (45)

Below the omda the power structure does not have such rigidity, local administration being in the hands of tribute sheikhs.

> "The administration does not concern itself with fixing or approving the number of sheikhs; it is concerned only that every tribesman should be the responsibility of one sheikh as far as his payment of tax and his whereabouts are concerned". (46)

However, unlike amongst the Kababish, the position of sheikh can lead to the acquisition of greater political power, and is the first step to achieving the position of omda. Thus, amongst the Baggara, the organisation of politics and administration at the local level is based upon a hierarchical system, similar to that described by al Sammani (47) and shown in Figure 7.4.

Amongst the people of the Butana the organisation of local politics and administration more closely approximates the Kababish than the Baggara situation, for:

> ". . . . . the old system was dominated by one tribe, the Shoukriya, and in particular one family, the Abu Sins, who under Abdel Karim had become stalwarts of Condominium rule". (48)

Again positions of power were institutionalised through the establishment of nazirs and omdas, but most of these positions were occupied by members of the Abu Sin family and its close associates.

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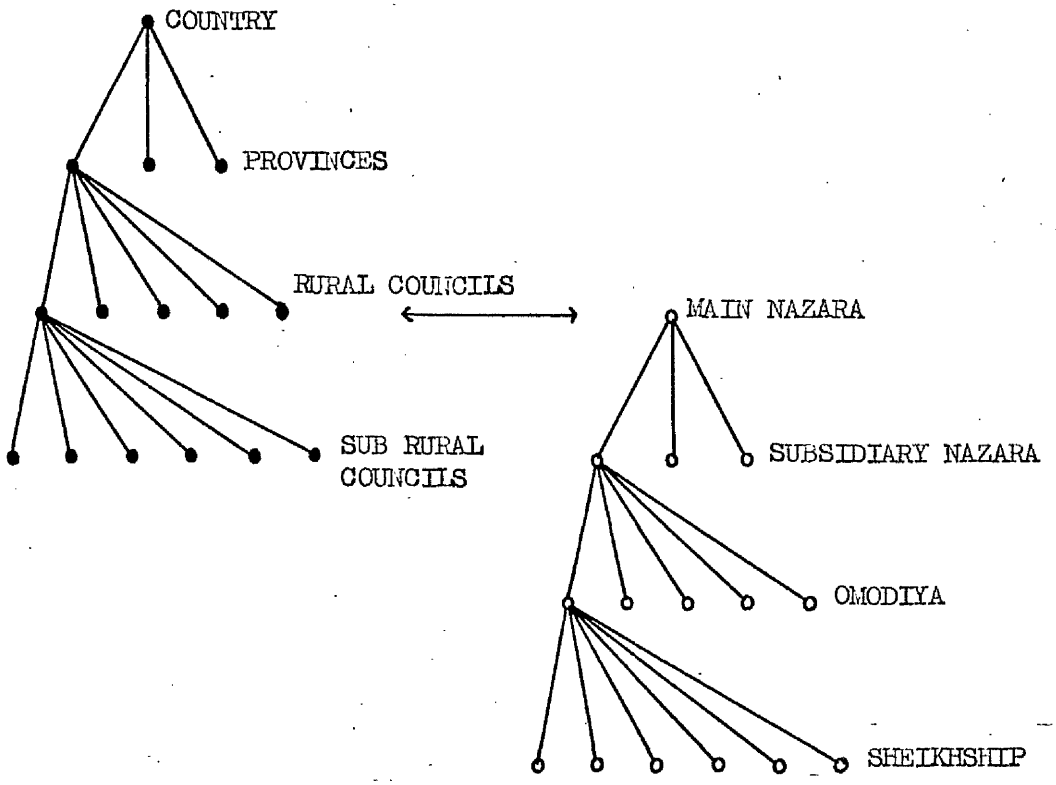
(45) Ibid. p. 137.

(46) Ibid. p. 151.

(47) M. O. al Sammani "A Study of Central Villages and Their Served Envelopes as Planning Units for Rural Development in the Sudan", University of Khartoum, African Studies Seminar Series No. 11, Sudan Research Unit, Faculty of Arts, University of Khartoum, 1971 p. 11.

(48) J. Howell (b) "Councils and Councillors 1969-72". In J. Howell (ed) (a) 'Local Government and Politics in the Sudan', Khartoum 1974 p. 93.

Figure 7.4. Civil and local administration hierarchy prior to the local government reorganisation.



Source: M.O. al Sammani. A study of central villages and their served envelopes as lower order planning units for rural development in the Sudan. African Studies Seminar Series. No. 11. Sudan Research Unit. Faculty of Arts. University of Khartoum. 1971.

Within recent years, however, a re-organisation of both the civil and the local administration has taken place, under which a new hierarchy has been established (Figure 7.5). This consists, at the lower order level, of village and quarter (in urban areas) councils, each of which is constituted of 42 members, of which 28 are elected by the inhabitants of the village, while the remaining 14 are appointed by the local district administrative council, and usually consist of local officials, such as police officers, nurses and medical officers. One further feature of these councils is that 6 of the 42 members must be female (49). In effect the new re-organisation has not supplanted the standing of the traditional political leaders, who are still turned to for advice, help and guidance. Thus:

> "In the Shoukriya Rural Council . . . . . more than half of the councillors came from the tribal chiefs - Nazirs, Omdas and Sheikhs . . . . . Outside the council the Executive Officer depends on the same tribal hierarchy to implement the council's decisions". (50)

But the re-organisation has enabled other members of a village community to take part in local politics, and at least to make their opinions known. This re-organisation has not come about due to the settlement of nomads on the scheme, but is a nationwide re-organisation, imposed by the central Government, and as such cannot be taken into account in assessing the greater involvement of the formerly nomadic population of the scheme in local political matters, except in that the presence of the scheme facilitated such a re-organisation because of the greater concentration and permanence of the population. Nevertheless, it is one means by which the population has contact with the local administration of the area, and by which it can make known its needs and opinions.

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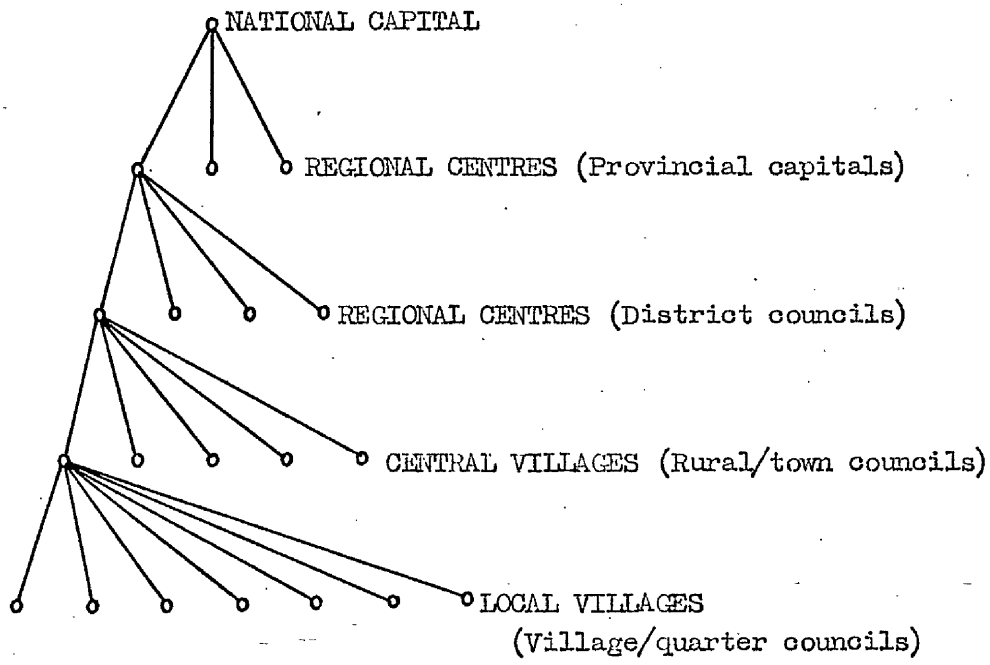
(49) Personal communication: Council Offices, New Halfa.

(50) Galobawi M. Salih, writing in 1962, quoted in J. Howell, op. cit. p. 89.

Figure 7.5. Civil and local administration hierarchy after the local government reorganisation.



Source: M.O. al Sammani. A study of central villages and their served envelopes as lower order planning units for rural development in the Sudan. African Studies Seminar Series. No. 11. Sudan Research Unit. Faculty of Arts. University of Khartoum. 1971.

7.7.3 Other Political Activities

Political representation and participation within the scheme is not restricted solely, or even primarily, to these village councils, for 2 other types of political organisation exist by which the population maintains contacts with the administration: first, there is the Farmers' Union, whose primary aim is to represent the interests of the tenants in matters relating to agricultural production, and its organisation and administration; and second, there are organisations, such as the Village Development Committees, Youth Union and Rural Promotion Union, which are essentially concerned with matters relating to the social development of the scheme. Each operates in a different fashion, and is concerned with a different department of the administration. Thus, while the Farmers' Union operates through representation to the A.P.C. and the Irrigation Department, the other organisations deal with the district council administration and operate largely through self-help projects. Both types of organisation have, however, been facilitated by the settlement of the nomads, their permanence and grouping together allowing greater communication and co-ordination, factors which were outside the scope of the population when it was following a migratory existence.

7.7.4 Methods Of Operation

a) Farmers' Union. The Farmers' Union consists of all the tenants on the scheme, numbering some 22,000 in all. The Union is made up of some 87 branches, each of which sends 2 representatives to the General Assembly which is held once a year. At the General Assembly a 58-member Administrative Committee is elected, whose function is to formulate policy and to generally organise and administer the running of the Union. From this committee is chosen a 13-member Executive Committee, through which the problems and grievances of the tenants are communicated to the administrative bodies within the scheme. The running of the Union is financed by annual

subscriptions from the tenants, amounting to LS 5 per tenant per annum (51).

The Union, therefore, operates through the presentation of demands and requests of the tenants to the administration. Inevitably in a military state, such as the Sudan, accession to these demands by the administration varies with the nature of the demands, and it is worthwhile giving examples to illustrate the interplay between the Union and the administration. During the 1973/74 season there was a shortage of wheat seeds to the tenants: this was brought to the attention of the Union who informed the A.P.C., and as a consequence seeds were distributed to the tenants on a loan basis. On the other hand, the Union demanded during the 1973/74 season that the 2 per cent Reserve Fund, derived from the profits of the cotton crop, and to be used for social development or in the case of emergency should be handed over for management to the Union, as the tenants had as yet received no benefits from the Fund, which had not been used. Rather than give a refusal to the Union, however, the Corporation deferred the matter for discussion under the Management Committee, a body which had yet to be constituted, and which was to consist of representatives of the Union and members of the Corporation. Although, therefore, the Union can keep the administration informed of the problems and needs of the tenants, and in addition keep the tenants informed of the happenings on the scheme by means of a regular news-sheet (see Appendix K) its power and influence is limited, due to the over-riding power and control of government agencies.

b) Self-Help. Brief reference has already been made to self-help in previous sections on the provision of social services, and its importance in helping to increase the availability of certain services. Self-help projects of various kinds have been implemented by the majority of villages

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(51) All information on the Farmers' Union comes from personal communication with the Union in New Halfa.

in the Arab area of the scheme, and testify to the success and workability of the concept. At this stage it is necessary to give some indication of the concept of self-help as applied to the scheme at Khashm el Girba, and also the methods by which it functions. Implicit in the concept of self-help is the idea that communities should not become too dependent upon government for their progress and development, but should be guided to realise their own desires and requirements, through largely their own efforts. Thus, for the settlers on the scheme at Khashm el Girba it is an attempt to make them more self-dependent, but it is true to say that this idea has been directed at the former nomads settling on the scheme rather than the resettled Nubian population, for the latter were provided with extensive services in their villages from the very outset of the scheme, and consequently, have felt little desire to undertake self-help projects. Indeed the presence of the discrepancy between the services provided for the Nubians and those provided for the former nomads, although it has led to some antagonism and resentment amongst the latter, has nevertheless, encouraged them to participate fully in self-help projects.

The operation of a self-help project is usually initiated by one of the various village committees on the scheme, which recognising the need for or desire for a particular service or building, such as a new mosque or a school extension, collect monetary contributions for that purpose from the inhabitants of the village. The project is then presented to the Council offices in New Halfa, where any technical assistance required is provided, such as architects or qualified builders. The actual construction of the building is usually undertaken by the villagers themselves in their spare time, under the expert's guidance (Figure 7.6). Through self-help projects such buildings and services as mosques, nurseries, schools and extensions to existing schools have been completed, and it is felt necessary, here, to give some selected examples of self-help projects in progress as illustration.

Figure 7.6. The construction of a mosque in the village of New Baraysi from funds gathered through self-help.

Thus, in the village of Umrahau by the Atbara river an elementary boys' school was provided by the government, to which girls were also allowed to go. However, the Rural Promotion Union in the village suggested that, because of the popularity of the school, a separate girls' school should be built, and, in addition, an annexe to the boys' school and a dormitory for the teachers. Through self-help approximately LS 1,000 was raised for the 3 projects: the girls' school was built largely from traditional materials - mud, wood and raffia, but both the extension to the boys' school and the dormitory were brick-built, and for their construction expert advice was obtained from the Council in New Halfa.

A second example is provided by the village of New Baraysi on the west side of the scheme, which was provided with no facilities at all by the government, although, lying only half a mile from Block headquarters, it was situated close to a dressing station and a water filter. The necessity of having a nearer supply of water prompted the villagers, through the village committee, to apply for water to be piped from the filter to taps in the village. The required finance was raised through self-help, and most of the labour was provided by the villagers themselves. In addition the same village has built a school and was in the process of building a mosque at the time of the author's visit, both through self-help. For the latter, the Council had provided a qualified architect to design the building and an engineer to supervise its construction.

Similar projects have been implemented throughout the non-Nubian villages on the scheme, and the 2 examples above serve as an illustration of the range of services it is possible for self-help projects to make available. Self-help may, however, be important in another respect to improving social services and conditions, for the utilisation of self-help to improve the villagers' situation through their own efforts implies a sense of identification with the land which they inhabit, and indicates a

permanence in the nature of the settlement. Consequently, self-help can be said to aid the process of settlement. Where self-help is not common, amongst the Nubians, absenteeism has been shown to be high (52), and this situation supports the contention that:

> ". . . . . the most sure way of achieving self-help is to avoid doing for settlers anything they can do for themselves". (53)

It is arguable that if too much is done for settlers they are likely to become dependent on the authorities, and unwilling to do anything for themselves. Such an attitude is less likely to encourage a feeling of identification with the place of settlement, and consequently, will hinder the successful working of the scheme. Thus, although the government may have been criticised for not providing the former nomads settling on the scheme with facilities equal to those of the resettled Nubians, this has resulted in a great interest in self-help projects, which has been shown not only to be important from a social point of view, but also in terms of the success of the settlement of the population on the scheme on a permanent basis.

7.7.5 Summary

The settlement of nomads on the scheme at Khashm el Girba has enabled them to organise themselves into groups which have a political nature, although they may function to improve social conditions. In the context of the original hypothesis of this section, the growth of such groups has led to the greater involvement of the population in local politics. However, it is necessary to ask to what extent such groups, through their actions, have a real influence on local politics and decision-making within the scheme. Although, through the village councils and the Farmers' Union, there is

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(52) See G. Sorbo "Economic Adaptations in Khashm el Girba", African Study Seminar Series No. 14, Sudan Research Unit, Faculty of Arts, University of Khartoum 1972 p. 14.

(53) R. J. Chambers (ed) (b) op. cit. p. 255.

representation for the inhabitants to the local administration, such bodies are only as effective as the local administration will allow. Nevertheless, the fact that the local administration is in regular contact with the representatives of the inhabitants is beneficial, for it can be thus made aware of the needs, problems and grumbles of those inhabitants. However, the most effective of the political bodies operating on the scheme, from the point of view of the inhabitants are those which employ the concept of self-help, for they can, if necessary, operate without the co-operation of the local administration. Such bodies have been shown to be extremely effective in improving the social conditions in villages throughout the Arab area of the scheme. On the whole, therefore, the settlement of nomads on the scheme has allowed for their greater participation in local political activities, and also facilitated the greater effectiveness of that participation.

CHAPTER EIGHT

CONCLUSION

8.1 Introduction

The scheme at Khashm el Girba represents, in part, an attempt by the Government of the Sudan to settle a proportion of its nomadic population, and as such is following a trend towards the general decline of nomadism, which can be seen, not only in the Sudan, but throughout the Middle East and much of Africa. Conclusions in relation to various aspects of the settlement have been presented at the ends of the main chapters, but here it is intended to give an overall conclusion, and to attempt an assessment of the scheme. From this it is hoped to be able to define the major factors affecting the scheme's performance, with a view to examining their relevance not only to the future of the scheme at Khashm el Girba, but also to other such schemes which may be implemented, in line with the main aim of the thesis presented in the Introduction (1).

In assessing any settlement scheme's performance, it is necessary to establish definite criteria as a basis, but such criteria, although some may be applicable to settlement schemes in general, should relate specifically to the aims and purposes of the particular scheme under consideration. In addition, such an assessment should also involve a comparative aspect, and should not examine that scheme in isolation.

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(1) See page 33.

8.2 Criteria For Assessing The Scheme's Performance

The criteria for the assessment of the scheme at Khashm el Girba have been mentioned, at least implicitly, throughout the thesis, but here it is intended to give them more explicit expression. In relation to settlement schemes in general, and the criteria used to evaluate them:

> ". . . . . the 3 most commonly and conventionally applied are effectiveness of settlement, the achievement of political aims and economic development". (2)

All of these criteria are relevant to the scheme as a whole at Khashm el Girba, for in a scheme where one of the explicit aims was to achieve the settlement of nomads (3), any assessment must include an examination of the effectiveness of that settlement. But, at Khashm el Girba, this was not the sole purpose of the scheme, for it also had a political aspect, viz the resettlement of the displaced Nubian population (4) - this aspect of the scheme, however, was outside the scope of the present thesis. Finally, as with all agricultural schemes in the Sudan, Khashm el Girba was also devised to increase agricultural production, and also, through the introduction of wheat and groundnuts, to diversify the basis of production (5), which policy can be defined as an attempt to promote economic development. All these factors attempt to assess the scheme's performance at a general level, and very much from the point of view of the Government, which is but one aspect of the necessary evaluation. It is also necessary to examine the scheme's performance from the point of view of the settler, which, although reflecting itself in the general view of the scheme's performance, because each

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(2) R. J. Chambers (a) "Settlement Schemes in Tropical Africa: A Study of Organisation and Development", London 1969 p. 250.

(3) See page 83 .

(4) See pages 82-83.

(5) See page 96.

settler is an integral part of the whole, is extremely important, for, existing at a lower level, it is more likely to be identified with the scheme's problems, which in the final analysis, must be solved for the scheme to be able to develop and improve.

In relation to the tenants' point of view 2 aspects are important in evaluating the scheme: first, the economic returns that the settlers receive from their activities on the scheme; and second, the level and nature of social conditions on the scheme, which must include the extent of the provision of social services.

To summarise, therefore, at the government level the 2 most important criteria for evaluation of the scheme involve its effectiveness in settling the nomads and its economic performance, while from the settlers' point of view both economic and social criteria must be used. Some evaluation of the scheme's performance using the above criteria has been presented in the concluding sections to the main Chapters, but it is worthwhile here summarising these conclusions and presenting a general conclusion, before going on to examine the factors affecting the performance of the scheme.

8.3 Evaluation Of The Scheme's Performance

8.3.1 Introduction

Throughout Africa and the Middle East agricultural development is achieved by overcoming the physical constraints imposed upon it. Thus, before the scheme at Khashm el Girba was inaugurated, the physical environment of the area, largely due to the rainfall regime and the consequent nature of the vegetation precluded any economic activity but livestock rearing on a nomadic basis (6). By controlling the waters of the River Atbara the constraint imposed by rainfall was removed, and irrigation made cultivation possible in a limited area of the eastern Butana. However, the

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(6) See pages 79-81.

introduction of irrigated agriculture did not mean the complete removal of physical constraints. Although soils were almost uniformly suitable for the cultivation of a wide range of crops (7), water supply still remained a problem. If the rainfall in a particular year is low then the level of water in the dam is reduced and there has to be a cut back in the area of crops sown (8), while the nature of the geology precludes the use of groundwater for the purposes of domestic water supply, a constraint which has only been removed in certain villages where water filters have been constructed to enable the safe withdrawal of water from the irrigation canals for domestic purposes (9). Therefore, although a major physical constraint has been removed to enable intensive cultivation to take place in the area, several smaller constraints still work to hinder the progress of the development of the scheme.

8.3.2 Physical Settlement

That the Government has succeeded in settling significant numbers of nomads on the scheme at Khashm el Girba is indisputable, especially when it is considered that all 16,000 tenancies available to such inhabitants were allocated, and that the actual rate of allocation of tenancies fell only a short way behind the planned allocation, so that the rate of settlement was slightly over 90 per cent, a high percentage in comparison with the performances of many other schemes in Africa and the Middle East (10). However, the allocation of a tenancy to a nomad did not and does not necessarily imply the complete settlement of that nomad. Indeed, of the projected 70,000 nomads to be settled upon the scheme, it was estimated that only

(7) See page 77.

(8) See page 74.

(9) See page 73.

(10) See pages 120-122.

approximately 20,000 had in fact become permanently settled (11). The actual performance in terms of physical settlement is, therefore, not as impressive as initial indications would suggest. In this respect the scheme approaches more closely the rates of settlement achieved elsewhere, and can be considered neither a complete failure nor an outright success, for large numbers of nomads have been settled, but not as many as was originally envisaged.

In order to place the performance of the scheme at Khashm el Girba in its correct context in settling its population, it is necessary to compare it with other settlement schemes in Africa and the Middle East. Such a comparison was presented in Chapter Four (12), and appeared generally favourable to Khashm el Girba, physical settlement rates in other schemes falling considerably below the rate at Khashm el Girba. The lack of success of such schemes is attributable to certain, often insurmountable, problems, and to attempt to achieve an understanding of why Khashm el Girba has been more successful in its attraction of settlers, it is necessary to examine some of the factors influencing the performances of these and other schemes in Africa and the Middle East. This analysis will be left until the performance of the scheme at Khashm el Girba has been examined in its entirety.

8.3.3 Economic Considerations

The fact that a high proportion of the tenants on the scheme have not settled permanently does not preclude their economic participation in agriculture on the scheme. Indeed, in economic terms, from the point of view of the Government, the scheme has been successful, for it yields an annual revenue to the Treasury, although it has, so far, not repaid completely its original investment (13).

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(11) See page 124.

(12) See pages 120-122.

(13) See page 178.

Affecting both the extent of the settlement on the scheme and its economic performance is the degree of success of the scheme from the point of view of its inhabitants. In economic terms, the scheme has not achieved an equalisation of wealth amongst the settlers, for the richer tenants are able to achieve greater returns, through their ability to provide greater inputs, while the poorer tenants are faced with the opposite situation. The rotation does little to help the situation, returns from cotton to the tenants being generally poor, while wheat suffers the most from the problem of water shortage, and groundnuts are expensive to cultivate in spite of yielding the greatest returns (14). Thus, the majority of tenants on the scheme are unable to innovate, and have little incentive to maximise their efforts on cultivating the crops of the rotation. Instead, they choose to diversify their economic interests, largely through maintaining their links with livestock rearing, either to the extent where livestock rearing is a more important economic resource than cultivation, or where income from cultivation is supplemented by income from livestock rearing (15). A similar trend of diversification of economic interests has been noted for the Nubian population of the scheme (16). Indeed, such a response to the economic conditions of the scheme may be an adaptation to the limitations of the scheme, and particularly to the scheme's crop rotation. In view of such limitations, continued interests in livestock rearing are probably a more rational response to economic and other conditions than that originally proposed, viz complete dependence upon the rotation, and the consequent divorce with the former way of life. On the whole, therefore, apart from

(14) See pages 237-238.

(15) See pages 249-253.

(16) G. Sorbo "On- and Off-Scheme Interests", University of Bergen 1972.

the richer elements of the population, agriculture on the scheme has not offered the opportunities for economic success. Only an expansion in the cultivation of groundnuts with their high returns could help some of the poorer tenants, and the cultivation of that crop is hindered by financial constraints, so that before further developments can be made on the scheme in terms of agricultural production, several problems need to be tackled. The nature of these problems will be discussed later.

8.3.4 Social Considerations

In social terms the situation on the scheme is somewhat more favourable, with greater health and education facilities being available (17), while, at the same time, the permanent nature of much of the settlement on the scheme has enabled the growth of local political organisations (18). This too has helped social conditions through the utilisation of self-help projects (19). Nevertheless, problems in the social field remain, particularly in relation to the health situation, for the introduction of irrigation into the area has increased the threat of both malaria and bilharzia, both of which are now prevalent on the scheme (20). Present facilities for their combat are barely adequate to keep the disease under control, let alone allow their eradication, so that they promise to continue to be a major problem of the scheme's development and future.

8.3.5 Factors Affecting The Performances Of Settlement Schemes

It was demonstrated earlier that settlement schemes may not always achieve the levels of settlement for which they were originally designed (21).

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(17) See page 308.

(18) See page 313.

(19) See pages 316ff.

(20) See page 294.

(21) See pages 120-122.

An examination of some of the factors influencing such performances reveals that several factors emerge which are common to different settlement schemes. Such factors include the attitudes of the population involved towards settlement; the organisational and administrative framework; the nature of the tenancy arrangements on the scheme; and its economic feasability. This is by no means a definitive list of the areas where problems may occur. It must also be emphasised here, that the lack of settlement on any scheme may not itself be the root of the problem, but rather an indication that inadequacies within the scheme exist. It is now intended to examine how the above factors have affected the performances of certain schemes, and to compare that influence with the influence which the same factors have had on the scheme at Khashm el Girba.

a) The Attitudes Of The Population Concerned Towards Settlement.

Obviously, if a population has the desire to become settled on a scheme the problem of attitudes does not arise, but it is where attitudes are uncertain, or openly hostile, that problems can and probably will arise. Thus, in the attempts to settle the Bakiga of Uganda the low rate of implementation of settlement was caused:

> ". . . . . in part by the unwillingness of the Bakiga to move to the more distant schemes, for example Kigumbi and Ntoma in Bunyoro". (22)

While on the East Ghor Canal Project the people of the area were provided with no incentive to settle on the scheme because, due to a variety of factors:

> ". . . . . the project farmers' standard of living actually fell below that of the non-project farmer". (23)

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(22) D. G. R. Belshaw "An Outline of Resettlement Policy in Uganda 1945-63". In R. J. Apthorpe (ed) 'Land Settlement and Rural Development in Eastern Africa' Nkanga Editions, No. 3 Kampala 1968 p. 19.

(23) G. R. Sutcliffe "The East Ghor Canal Project: A Case Study of Refugee Resettlement 1961-66". In M. E. Journ. Vol. XXVII, Autumn 1973 p. 481.

In comparison, at Khashm el Girba, attitudes towards settlement amongst the nomads of the area were favourable both before the implementation of the scheme (24), and throughout its development:

> ". . . . . no difficulty was experienced in finding local persons from local tribes to take tenancies". (25)

b) The Organisational And Administrative Framework. Problems relating to the organisational and administrative framework may operate at a general level, including the level of government interference or commitment, or may be concerned with more specific aspects of management. It is, however, in both contexts, a factor which has received little attention in the analysis of the scheme failures (26). At the general level, in Uganda, the settlement of the Bakiga was not implemented very successfully, partly because government policy, under the Ankole and Toro Governments, changed so that a restriction was imposed upon the size of the settlement areas (27). But the general management of a scheme may also suffer from lack of co-ordination between several government departments. Thus, on the Dujaila scheme of Iraq, the weaknesses of organisation:

> ". . . . . result from a lack of co-ordination between local needs and central authorities . . . . . Several different Ministries . . . . . are responsible for different activities, and neglect them, since there is no organisation at the settlement itself to co-ordinate their spheres or to urge on the action of the authorities". (28)

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(24) I.L.O. Report to the Government of the Sudan on "The Sedentarisation of the Nomadic Tribal Populations in the Butana Region of Northern Sudan", Study Planning Mission Nov 1963 - Feb 1964, ILO/TAP/Sudan/R8 EPTA Geneva 1965 p. 256.

(25) M. Y. Sukhar and M. H. el Jack "Mass Resettlement of the Population of the Lands Flooded by the Aswan High Dam: A Socio-Economic Appraisal of the Resettlement of the People of Wadi Halfa at Khashm el Girba Agricultural Scheme". In Papers presented to the National Conference on Human Environment and Development, held 5-12 February 1972, Khartoum 1972 p. 42.

(26) R. J. Chambers (ed) (b) "The Volta Resettlement Experience" London 1968.

(27) D. G. R. Belshaw op. cit. p. 18.

(28) D. Warriner "Land Reform and Development in the Middle East: A Study of Egypt, Syria and Iraq", Royal Inst. of Int. Affairs, London 1957 p. 166.

In relation to Khashm el Girba, the first problem mentioned does not arise, for the land available to the scheme has been increased rather than restricted. The original 25,000 feddans within the project area for the settlement of nomads was, at first, to be supplemented by lands outside the scheme subject to less government control, to be utilised by the construction of a drain to the west of the scheme in order to bring water to the area, but this was subsequently converted into a branch canal and the lands incorporated into the scheme proper (29).

The situation existing at Dujaila, however, raises 2 interesting points in which Khashm el Girba differs, and thereby does not suffer constraints upon its development. First, all government authorities responsible for the management of the scheme are located within the scheme itself (30), which contrasts directly with the Dujaila situation; and second, although several different government departments are, as at Dujaila, responsible for different spheres of organisation within the scheme, the co-ordination between these departments is generally good. It is probably true, that this second state of affairs is a direct result of the first, namely that all the departments are located close together. Thus, the reverse of the situation at Dujaila, which was not a success, has worked to facilitate the success of Khashm el Girba in operating and attracting settlers.

At a more specific level, on Khashm el Girba such matters as crop production and distribution of irrigation water are closely supervised by government, whose interests in the area are not other than administrative. In such a situation, the mismanagement of water resources for personal gain is unlikely. However, in some schemes distribution of water does represent a problem when in the hands of interested parties, and this has been

(29) I.L.O. op. cit. p. 18.

(30) See pages 84-85.

particularly remarked of the Helmand Valley in Afghanistan:

> ". . . . . although we tend to look at water management as a technical problem, as long as it remains in the hands of the local tribal, indigenous socio-political system, we must recognise and attempt to understand this probably most dominant variable in the situation. Control of irrigation water within this indigenous political system is synonymous with power". (31)

c) The Nature Of The Tenancy Arrangements. Agricultural development in the Middle East has been greatly concerned with land tenure arrangements, and, in relation to land settlement, 2 aspects are important: the nature of the land tenure system prior to the implementation of the scheme concerned, and the tenancy arrangements existing on the scheme vis-a-vis the settlers. In connection with the first of these 2 points, the Sudan is probably unique amongst the countries of the Middle East (32), for there most of the land is under government ownership, with rights vested in either groups or individuals (33). With such a situation, the implementation of a settlement scheme does not require the re-organisation of land ownership, for the land to be utilised is under government control in any case. In other countries, however, such is not the case, and attempts at land settlement had perforce to include attempts at land reform. Thus, in Tunisia attempts were made to undo the landholding power of the European colonisers, but, because of the fear of the smaller landowners that their lands would be confiscated, they sold it to the richer landowners, to the effect that the colonial landowning class was replaced by an indigenous landowning class (34). Similar attempts at land reform in connection with land settlement programmes have been

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(31) R. B. Scott "The North Shamalan: A Survey of Land and People, Helmand Valley, Afghanistan", AD/DP/USAID/Afghanistan, August 1971 p. 36.

(32) See page 90.

(33) See page 92.

(34) J. L. Simmons "Agricultural Co-operatives and Tunisian Development". In M. E. Journ. Vol. XXVII, Autumn 1973 p. 481.

attempted in Iraq and Jordan. Thus, the Dujaila scheme in Iraq was implemented partly in an attempt to bring about the Miri Sirf land reform, but the attempts to push through the programme were none too successful:

> "Thus, the scheme has not been enforced as the law originally intended, for there is little change in methods of farming, and ownership by the cultivators is not general". (35)

On the East Ghor Canal Project in Jordan similar problems were met:

> ". . . . . higher operating costs - and the crucial fact that most of the project farmers are still sharecroppers - seem to have kept net income down". (36)

and it is subsequently concluded that on the scheme:

> ". . . . . the crucial mistake seems to have been the failure to carry out a real land reform programme". (37)

Thus, unfavourable land tenure arrangements and the need to implement land reform programmes have hindered the development of many settlement schemes, and the lack of such problems in the Sudan has made the development of not only the Khashm el Girba scheme, but also of other irrigation schemes in the country much easier.

Once the scheme was implemented at Khashm el Girba, the traditional grazing lands with their rights vested in the tribal community as a whole, became distributed amongst individuals in the form of tenancies, with certain conditions of tenure (38). While such a situation might, it seems, lead to a lack of identification with the land, the de facto situation is such that security of tenure is reasonably strong (39).

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(35) D. Warriner op. cit. p. 164.

(36) G. R. Sutcliffe op. cit. p. 481.

(37) Ibid. p. 481.

(38) See page 93.

(39) See page 93.

d) The Economic Feasibility Of The Scheme. The ultimate test of whether a scheme will operate successfully or not is determined by its economic feasibility, for only in exceptional circumstances will governments subsidise schemes which are not so after the initial period of implementation. Where this does occur, it is symptomatic of the political necessity of making a scheme appear operative. Thus, on the Mwea scheme in Kenya:

> "Without any prospect of substantial revenue in its early years the Scheme was dependent on continued financial support not only for expansion but for its very survival". (40)

Programmes at developing the Helmand Valley in Afghanistan have met with similar problems:

> ". . . . . the government has no income to re-invest in improvement and maintenance. The government has to continue spending funds from the Central Treasury". (41)

Being essentially revenue producing (42), the scheme at Khashm el Girba does not have to depend on central government, and can therefore develop of its own accord, and is not shackled by any financial constraints.

The scheme at Khashm el Girba has benefitted, therefore, in its development from several favourable aspects, notably the consistency of the government attitude, the nature of the land ownership arrangements in the Sudan, the attitudes of the tenants and its ability to produce sufficient revenue not to be a drain upon central funds.

8.3.6 Summary

Overall, therefore, although the scheme has succeeded in settling large numbers of nomads from the surrounding areas, and also contributes significantly to the national economy, it cannot be termed an unqualified success

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(40) R. J. Chambers (a) op. cit. p. 65.

(41) L. L. Mitchell and D. A. Garner "An Assessment of the Helmand Arghandab Valley Region", first draft for comments by HAVA and Usaid, 1973 p. 10.

(42) See page 178.

in the way it was supposed to develop, for many of the scheme's tenants are not settled permanently and still retain primary interests in livestock rearing, while many of those who have settled themselves retain interests in livestock. The adaptations thus made by the settlers need not, however, be taken to mean that the scheme has been a failure, for if the point of view is taken that these responses are based on rational economic lines, then it can be concluded that the settlers, through these responses, have made a reasonable success of the scheme in the only way possible. If such adaptations had been barred for settlers on the scheme it is possible that many nomads would not have settled because the scheme would not, by itself have provided a realistic economic alternative to pastoralism, and consequently, the scheme would have been a failure. Nevertheless, the scheme still faces several problems, not least that its very nature has perpetuated the existing economic hierarchy of the society, from which it is difficult to break out, with the result that incentives for economic improvement using cultivation on the scheme are low, which inevitably has led to a depression of the overall economic effectiveness of the scheme *per se*.

8.4 Factors Affecting The Performance Of The Scheme

8.4.1 Introduction

It has been demonstrated that in certain respects the scheme's performance has been less than satisfactory, especially in economic terms when taken from the point of view of the tenant, which may be a factor behind the shortfall in the numbers actually settled on the scheme. It is now necessary to attempt to define some of the problems which have helped to affect this situation. The most serious aspect of the scheme appears to be the way the organisation of agricultural production has maintained the economic divisions within the settling community. The one fundamental factor affecting this situation is the nature of the crop rotation, but

while a change in this rotation might alleviate some of the problems of the tenants, and would almost certainly be popular amongst them, such a change is unlikely to happen: from the point of view of the tenants the best crop to exclude would be cotton, which is unpopular due to its relatively low returns, and also because of the degree of intervention from the government in its production. But, while it continues to be the mainstay of the country's economy, it is unlikely to be removed. Similarly, with the expansion taking place throughout the country in the areas under wheat and groundnuts, these crops are also unlikely to be replaced. With such a rigid situation, therefore, the only way to attempt to overcome the problems which the scheme is facing is to deal with those factors which are directly affecting the performance of the crop rotation. Four factors can be defined as influencing the performance: the shortage of water; the inefficiency of many of the tenants in the techniques of cultivation; the inadequate communication between tenant and the administration; and the financial constraints affecting many of the tenants. In an attempt to outline the problems related to these factors, and possible ways in which their detrimental influence may be reduced, each factor will be dealt with separately.

8.4.2 The Shortage Of Water

Although a serious shortage of water due to poor rains has, thus far in the scheme's history, occurred only once, during the 1972/73 season, water shortage is a problem which recurs year after year, as has been pointed out in the Farmers' Union newsletter (43). This shortage which affects the scheme towards the end of the season, is particularly important in relation to the wheat crop, which is the last to be both sown and harvested, and is, consequently the crop most affected by any water shortage.

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(43) Farmers' Union Newsletter No. 9, November 1974.
For a translation of this newsletter see Appendix K.

This is of particular importance to the tenants, because, of all the crops in the rotation, wheat is the most favoured giving better returns than cotton, and being more easily cultivated than groundnuts (44). Inevitably the blame for the water shortage has been attributed by the tenants to the administration, and by the administration to the tenants. Thus, the officials of the scheme maintain that it is the inefficient use of water that is at the heart of the problem, and this inefficiency manifests itself in many ways: first, the crops are generally not sown at their optimum date, which for groundnuts and cotton means that adequate use of the rains is not made, with the result that these crops use more water from the dam than was originally intended. Second, much water is lost through careless use, such as the submerging of the cotton crop completely, when such flooding is not required, or the inefficient upkeep of the canals allowing water seepage to take place (Figure 8.1). In the view of the authorities, the water shortage problem would be minimised if the efficiency of the tenants were improved in these aspects of water usage.

This argument cannot wholly be supported, however, for only 45-50 per cent of the land allocated to groundnut cultivation is actually utilised, so that, were groundnut cultivation to be at full capacity, the crop's demands on stored water from the dam would be even greater than they are at present, further exacerbating the water shortage problem. Rather than the water shortage problem being mainly due to inefficient use, therefore, it seems that it is the result of attempting to irrigate too large an area for the capacity of the dam above Khashm el Girba village. While efficient watering methods would undoubtedly lessen the problem of water shortage, it would not completely solve the problem, which is a necessary step if the scheme's full potential in wheat and groundnut production is to be realised.

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(44) See page 238.

Figure 8.1. Water seepage onto road from an irrigation canal.

The solution must lie in either an increase by some means of the available amounts of water for irrigation, for example through the construction of a small feeder dam, of a change in the rotation, which would make it less demanding on the available water resources. This would be possible if the cotton crop were replaced by a second groundnut crop, for groundnuts can make use of water from the rains, as they are sown in July. Were such a change to take place, by the end of November, when the groundnut crop begins to be harvested, 2-thirds of the scheme's area devoted to the rotation would not require irrigation water, so that the wheat crop would, from then onwards, be the sole user of water available for agricultural purposes. A further advantage of such a rotation would be that livestock could be allowed on the scheme, at least over most of its area, to graze on the stubble of the groundnut crop, at a time when natural pasture was in short supply. However, for the reasons mentioned earlier, a change in the rotation is very unlikely, especially if it involves the elimination of cotton.

8.4.3 The Tenants' Inefficiency In Cultivation

The inefficient utilisation of water by tenants has just been mentioned in relation to the water shortage problem, but in other respects as well, the tenants have been accused of being inefficient cultivators, in some cases this being attributed to the lack of acquaintance with cultivation prior to settlement. As was demonstrated earlier (45), this is not an entirely accurate picture, because those tenants who have more resources are more able to afford the costs of cultivation; and the differences in yields achieved by different tenants are not necessarily a function of the efficiency of the tenant, but may be influenced by his economic position (46).

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(45) See page 260.

(46) See pages 262-263.

Nevertheless, the use of incorrect techniques cannot be ignored as a factor influencing the variations in yields obtained. However, this is itself affected to a certain extent by the third factor under consideration here, viz the lack of communication between tenants and the administration, for it is through improved extension services, as well as through the practical experience gained over time by tenants, that the tenant is going to be able to learn the best techniques for the cultivation of his crops. Thus, an improvement in the standard of extension services, which have been examined earlier (47), might help to eliminate some of the problems arising out of the tenants' general inefficiency in performing the cultivation of the crops in the rotation.

8.4.4 Financial Constraints

That the nature of agricultural production on the scheme favours the richer elements of the population has been demonstrated earlier (48), but for the remainder of the population financial constraints operate to restrict their ability to improve themselves within the framework of the scheme. This is particularly so in the cultivation of groundnuts, where costs of production are considerably higher than for the other crops. However, financial constraints operate not only in the cultivation of groundnuts, for another function which the tenants serve is the clearance of weeds from the minor canals, which directly feed the fields. For this operation the tenant is supposed to receive a loan from the Irrigation Department, amounting to LS 20, so that he can hire labour to do the job. However, the Department will only pay the loan after the completion of the clearance. This has the effect that the poor tenant, who cannot afford to hire labour for the job, has either to do it himself, and thereby neglect his fields,

(47) See pages 262-263.

(48) See page 264.

or to leave the canals weedridden, which not only affects the condition of his own crop, but that of his neighbours as well, as the weeds spread. In effect, to such a tenant, the loan is made unavailable, which defeats the whole object of its very existence.

Similarly, credit facilities are available, and utilised, for the cultivation of groundnuts (49), but it appears that in both cases, to encourage a greater cultivation of groundnuts and a greater clearance of weeds, that such loan facilities should be made less restrictive. This is especially true for groundnuts, which are a particularly remunerative crop, to the extent that usually, if a tenant can establish a groundnut crop, his income from that crop is sufficient to maintain the crop, which helps to generally increase his level of economic development, through an increased level of agricultural production.

These are 2 examples where financial constraints facing the poorer tenants could be eased if they were encouraged through the availability of more favourable conditions for loans. As perhaps the major factor inhibiting the development of the scheme, the presence of an economic hierarchy out of which it is difficult to break, is the situation which requires the greatest attention, for if the poorer tenants on the scheme were helped to make themselves economically better off, not only would overall agricultural production increase, but also some of the tenants who still maintain their interests in livestock rearing might be encouraged to settle down permanently, if they could see that the economic prospects of the scheme were becoming more favourable.

8.4.5 Further Factors Affecting The Performance Of The Scheme

Two other main factors have helped in inhibiting the scheme's development, neither of which are unique to Khashm el Girba. The health problem

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(49) See pages 226ff.

with the spread of bilharzia and malaria is one which commonly affects irrigation schemes, and which has been seen in the pump schemes of the Nile and on the Gezira. With the limited resources available at present, the best thing that can be hoped for is that both diseases are not allowed to get out of hand, which requires the availability of sufficient medical supplies, such as spray and vaccine. A suggestion, in relation to bilharzia, which is now too late to be of relevance to Khashm el Girba, but might help in future developments in irrigated agriculture, is the possibility of lining the irrigation canals, which would greatly facilitate the collection and control of the bilharzia snail.

The second factor which may have helped to inhibit the scheme's development relates to the settlers' former pastoral way of life. In this respect Khashm el Girba differs little from most of the Sudan's agricultural schemes, from the Gezira to the pump schemes, where little, if any, provision was made for the maintenance of animal herds of significant size, the primary focus being on crop production. In spite of this situation, livestock rearing is still practiced by more than half the inhabitants of the scheme, in addition to cultivation. Again this is not unique to Khashm el Girba:

> "The physical transformation of the Managil area was completed in 5 years. The new tenant now finds himself in a totally different agricultural system. Yet his attitudes and aptitudes are still largely those of a nomadic livestock owner. There is some evidence that he invests any profits he makes in more livestock, and not in agricultural operation in the Scheme". (50)

At Khashm el Girba over 50 per cent of the tenants still maintain herds on the Butana. While this is probably a rational economic adjustment to the new conditions existing in the area, it may also, to some extent, represent a reluctance to part with an established means of gaining a living.

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(50) D. J. Shaw "The Managil South-Western Extension to the Sudan Gezira Scheme", Wageningen International Institute for Land Reclamation and Improvement, 1965 Bulletin No. 9 pp. 32-33.

Such inattention to the livestock sector is particularly surprising when it is considered that this sector has perhaps the greatest potential for future development within the Sudan as a whole. Furthermore it:

> ". . . . . appears economically wasteful to neglect the nomads' skill in animal husbendry". (51)

for involvement in an essentially commercial enterprise, namely the irrigated agriculture, may help to induce the settlers to adopt a more commercial attitude to their livestock. Indeed, there is some evidence to support this contention:

> ". . . . . livestock owners in Kassala Province living in the vicinity of large towns held a far more commercial attitude to selling than did those further removed from centres of population". (52)

Furthermore, in moving into what was essentially a strange environment, the presence of some provision for animals would have given the settling nomads some item of familiarity with which to focus. Indeed, all in all:

> ". . . . . the Khashm el Girba scheme would have been ideal to start such integration (of livestock with cultivation) since the local tribes settled on the scheme were originally animal owners and used to depend entirely on their animals for living". (53)

Thus, it can be stated that the lack of adequate provision for the integration of livestock into the scheme during its initial phases was a planning mistake which should not be overlooked in relation to other schemes. At Khashm el Girba, such an integration would now be difficult to achieve, for it would involve a spatial re-organisation of the scheme to provide grazing areas, and/or a change in the rotation to include a fodder crop. In any event, the settlers have, through their own responses to the economic

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(51) Republic of the Sudan (h) Ministry of Finance and Economy, "Roseires Pre-Investment Survey", Report No. 2 'Rahad Project', Vol. IV Agriculture, London 1965 p. 73.

(52) Sir A. Gibb and Partners "Kassala Province Survey" London 1968 p. 114.

(53) M. Y. Sukhar and M. H. el Jack op. cit. p. 34.

conditions of the area achieved an integration of livestock rearing with cultivation under irrigated conditions, which, it is suggested, is a better response than the one which was originally envisaged, involving only minimal contact with animals.

8.4.6 Favourable Aspects Of The Scheme's Development

In any large-scale scheme such as that at Khashm el Girba, at its present stage of development, problems are bound to have arisen and mistakes been made, but the scheme has, from the tenants' point of view, been favourable in several aspects, particularly in relation to social development. Both health and education facilities are far superior to those existing prior to the scheme's existence (54), but the major advantage of the way the nomads were settled lies in the fact that very little was done for them, so that, apart from some basic facilities which are universally provided, the settlers had to make their own developments. This helped them to both settle down in a situation which retained some elements of familiarity, and to establish some degree of identification with the land they were settling on. This has been mentioned elsewhere as being the best way to achieve settlement in a smooth fashion:

> "From the point of view of settlers' motivation and performance, it is safer to be simple and to allow the settlers to establish themselves in familiar surroundings, if possible building their own houses . . . . . In this way they can more quickly gain a sense of being settled". (55)

Following on from this point has been the encouragement of the development of local political organisations and the emergence of self-help projects to help improve social conditions (56).

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(54) See page 308.

(55) R. J. Chambers (ed) (b) op. cit. pp. 254-255.

(56) See pages 316ff.

8.5 Summary

It has been demonstrated that in terms of the settlement of nomads, the scheme at Khashm el Girba has, thus far, been neither an unqualified success nor an abject failure, and, indeed, at a stage, some 10 to 12 years after the settlement of nomads in the area first began it is impossible to give a definitive assessment of the scheme's performance. However, the present study is presented as of value as an interim report of the scheme's progress to date and its present situation, but more importantly as an outline of the problems and factors which may stand in the way of its future development. In this respect several important points of relevance emerge, not only in relation to Khashm el Girba, but also to schemes which may be implemented elsewhere, particularly at the present time at Rahad. These points may be summarised as follows:

1. The need to include some adequate provision for the livestock of the nomads to be settled, although on Khashm el Girba the settlers were able, and were allowed to make their own adaptations to the new situation, which, although not enhancing the overall performance of the scheme, made economic conditions for the settlers themselves more comfortable.
2. The need to prevent the development of a marked hierarchical economic structure, which tends to preclude the improvement of the lower echelons of the society in relation to the total structure.
3. The need for a comprehensive and long-term extension service programme to educate the settlers in the necessary techniques for effective cultivation.
4. The need to make available adequate supplies of medical drugs and sprays to combat the dual threat of malaria and bilharzia.

5. The need for an adequate supply of water for the purposes of cultivation throughout the year, and a supply which takes account of the probable losses of water through the inefficiency of use and carelessness of both settlers and officials.
6. The advisability of allowing the settler to do as much for himself as possible, to the extent of constructing his own dwelling, and the necessity for the provision of means by which self-help projects can be developed, as both processes help the settler to more quickly identify himself with his new environment.

At Khashm el Girba, the first 5 of these points, with the exception of the one relating to livestock, all need attention, to enable the scheme to develop its potential further and increase its efficiency. Most of these problems require a closer understanding of and attention to the people who are most closely involved with cultivation on the scheme, that is the settlers themselves, for it is:

> ". . . . . ultimately through the people's response that development can be realised". (57)

At Khashm el Girba that response has taken the form of continued interests in livestock rearing, which suggests that, had there been sufficient provision for livestock rearing in the first place, the scheme might have attracted more nomads to become permanently settled within its borders, rather than their being occasional inhabitants.

What seems to be required on the scheme is a re-orientation of the attitudes of the people running the scheme, from one purely aimed at achieving high levels of agricultural production, to one which takes more account of the people actually involved in that production, for it is ultimately only through their participation that the desired end of increased agricultural production will be achieved.

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(57) G. Sorbo "Economic Adaptations in Khashm el Girba", African Studies Seminar Series No. 14, Sudan Research Unit, Faculty of Arts, University of Khartoum 1972 p. 28.

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Appendix A: The questionnaire.

Village: Reference No.

a). Demography.

1. To which tribe do you belong?
2. How many persons live in this household?
3. For each person living in this household give the following information: relationship to the head of the household
   age
   sex
   marital status
   place of birth
   level of education
   occupation
   location of occupation
4. How many members of your family are living away from this household?
5. For each member of your family living away from this household give the following information:
   relationship to the head of the household
   age
   sex
   marital status
   place of birth
   level education
   occupation
   location of occupation
   monthly earnings
   monthly remittances

b). Economic.

6. Do you have a tenancy on the scheme?

Questions 7-10 only to be asked if the answer to question 6 is 'yes'.

7. For how long have you had a tenancy?

8. For each crop you grew on your tenancy last season give the following information:
   - crop
   - area planted
   - when planted
   - area harvested
   - when harvested
   - amount produced
   - amount sold
   - income
   - where sold
   - area damaged
   - cause of damage

9. How many people work on your tenancy?

10. For each person working on your tenancy give the following information:
   - whether a member of the family or not
   - tribe
   - type of work
   - pay
   - hours of work
   - place of residence

Questions 11-14 to be asked only if the answer to question 6 is 'no'.

11. What is your occupation on the scheme?

12. Where is your occupation located on the scheme?

13. For whom do you work?

14. How many hours a day do you work?

All other questions in this section to be asked of every person interviewed.

15. For each type of animal owned give the following information:

type

number bought last year

where bought

price received

number sold last year

where sold

price received

number owned

where grazed

by whom tended

16. Do you grow any crops outside your tenancy?

17. If yes give the following information:

crop

where sown

area sown

when sown

area harvested

when harvested

number of harvests

amount produced

use of produce

income received

area damaged

cause of damage

18. Do you look after any other tenancy on the scheme?

19. If yes give the following information:

relationship to tenant

location of tenant

tribe of tenant

occupation of tenant

20. Do you have any other source of income?

21. If yes give the following information:

source

income

22. Did you borrow any money last year?

23. If yes give the following information:

from whom

amount borrowed

purpose

when borrowed

whether repaid

rate of interest

24. What was your income last year from the following sources?

a). tenancy

b). occupation if a non-tenant

c). livestock

d). other sources

e). total

c). Social.

25. Do you own any of the following items?

a). transistor radio

b). car or lorry

c). watch

d). sewing machine

e). bicycle

26. Have you ever visited the following towns?

a). Kassala

b). Gedaref

c). Khartoum

d). Port Sudan

27. Have you ever been outside the Sudan?

28. If yes which country or countries have you visited?

29. For the towns listed below give the necessary information:

	New Halfa	Massna	Khashm el Girba
number of visits per month			
purpose of visit			
mode of transport			

30. How many members of your household have suffered from disease during the last year?

31. For each member of your household which has suffered from disease during the last year give the following information:

relationship to the head of the household

disease

where treated

d). <u>General.</u>

32. Where did you come from to this scheme?

33. What was your occupation before you came to this scheme?

34. Why did you come to this scheme?

35. Has the scheme benefitted you?

36. If yes how has it benefitted you?

37. If no how has it not benefitted you?

38. What improvements would you like to see on this scheme?

Appendix B: Details of the climatic background.

a). Figures for temperature, humidity and evaporation at Khashm el Girba for 1971/72 and 1972/73.

month	max. temp. 1971/72	max. temp. 1972/73	min. temp. 1971/72	min. temp. 1972/73	humidity 1971/72	humidity 1972/73	evaporation 1971/72	evaporation 1972/73
July	41.1	41.7	19.4	20.7	64	73	13.6	13.6
Aug.	36.5	39.0	19.2	18.4	74	68	8.0	15.3
Sept.	39.3	40.8	18.8	21.0	61	61	8.5	13.2
Oct.	40.2	41.4	18.6	20.2	48	51	13.8	12.5
Nov.	40.2	39.0	17.2	15.5	40	56	13.8	13.4
Dec.	37.2	35.0	6.5	11.5	53	67	11.8	13.4
Jan.	37.9	39.3	12.5	8.0	67	62	11.0	13.1
Feb.	37.8	42.2	9.6	15.3	58	59	11.2	14.7
March	42.5	45.0	13.3	15.1	43	52	19.7	17.9
April	44.4	45.7	15.4	19.5	13	37	22.6	21.2
May	45.6	45.1	18.9	22.5	40	40	21.2	20.7
June	43.4	44.0	19.5	21.3	66	41	17.2	21.3

Figures for temperature are in degrees Centigrade, and for humidity and evaporation in percentages.

Source: A.P.C. Khartoum.

b). Figures for rainfall at selected sites within the scheme for 1971.

station	June	July	August	September	October	total
New Halfa	-	186.5	87.1	61.3	7.3	342.2
Inspectorate 1.	75	145	84	63	-	367
Inspectorate 2.	57	166	74.5	76.5	-	374
Inspectorate 3.	45.9	176.4	104	44.8	-	371.1
Inspectorate 4.	-	116	65.5	97.5	-	279
Inspectorate 5.	35	171	142.5	22	-	370.5
Inspectorate 6.	-	67	trace	trace	-	67
Umrahau	52	45	77	52	20	246
Umm Gargur	27	55	50	-	-	132
Salma Saroba	58	45	73	-	-	176
Village 13.	-	216	136	85	-	437
Village 14.	-	189	25	102	-	316
New Sufeiya	26	28	65	51	-	170
Saba'at	35	51	36	21	-	143

Figures are in mm.

Source: A.P.C. Khartoum.

o). Figures for rainfall at selected sites within the scheme for 1972.

station	June	July	August	September	October	total
New Halfa	116.5	51.5	106	84	3.5	291.5
Inspectorate 1.	62.3	114.9	60.5	23	26	286.7
Inspectorate 2.	61.5	152.5	62.5	29.2	29	334.7
Inspectorate 3.	61.5	53.9	41.3	20.6	19	196.3
Inspectorate 4.	49	37	106	15	18	225
Inspectorate 5.	110	51.5	164.5	8	16	350
Inspectorate 6.	36	49	63	6	13	167
Umrahau	76	22	94	7	-	199
Umm Gargur	80	10	43	-	-	133
Salma Saroba	35	43	12	-	-	90
Village 13.	59	237	209	27	12	504
Village 14.	86	23	19	13	-	141
New Sufeiya	66	72	68.5	-	-	206.5
Saba'at	75	39	10.5	1	-	125.5

Figures are in mm.

Source: A.P.C. Khartoum.

Appendix C: The tenants' accounts with the A.P.C.

a). Joint account.

i). Income.

1. The price received for the cotton crop.
2. The price received for the rest of the plant. i.e. the residue.
3. The price received for all other parts concerning production - seeds, etc.
4. The proceeds from the seeds sold for oil.
5. Seeds which have been medically treated and given to the tenants to sow.
6. The proceeds from the sale of any machinery which is considered obsolete, provided such machinery was originally bought by the joint account.
7. The proceeds from fines. i.e. from those tenants who have neglected their tenancies.
8. The proceeds from compensation. i.e. should a company responsible for spraying have neglected to fulfil its contract, resulting the damage of some of the cotton crop.

ii). Expenditure.

1. The preparation of the land through all its stages.
2. Cotton picking.
3. The clearing of the land from the grasses found in the cotton areas.
4. The costs of spraying.
5. The cleaning of the land.
6. The costs of fertilisers, including importation, transportation and storage.
7. The costs of the sacks for the storage of the cotton.
8. The tax on the seeds.
9. The cost of labourers hired for the picking of the cotton, including their transportation from other areas of the Sudan, where necessary.

10. The costs of weighing.
11. The costs of ginning.
12. The costs of combatting animals.
13. Insurance costs.
14. The costs of transportation, both to the ginning factory and to Port Sudan.
15. The costs of loading the ships.
16. The costs of advertising.
17. The costs of remuneration to the 'samad': there is one samad for every ten tenancies, which acts as an advisory body.
18. The costs of seeds.
19. The costs of storing and sorting.
20. The costs of combatting pests.
21. The costs of wages paid to the representatives selling the cotton.

b). Individual Account.

1. The clearing of the Abu XX canals.
2. The clearing of the Abu VI canals.
3. The construction of the necessary channels to feed the tenancies.
4. The construction of controls for regulating the supply of water to the tenancies.
5. The sowing of the cotton crop.
6. The first second and third cleaning of the cotton crop. i.e. the removal of those plants in the crop which are weak.
7. Making the storage facilities for the harvested crop until it is collected.
8. The costs of labour brought in by an inspector if a tenant has not been looking after his tenancy properly.
9. The price of the tenants' accounts note.
10. The costs of the supply of any machinery which is supplied at the

request of the tenant.

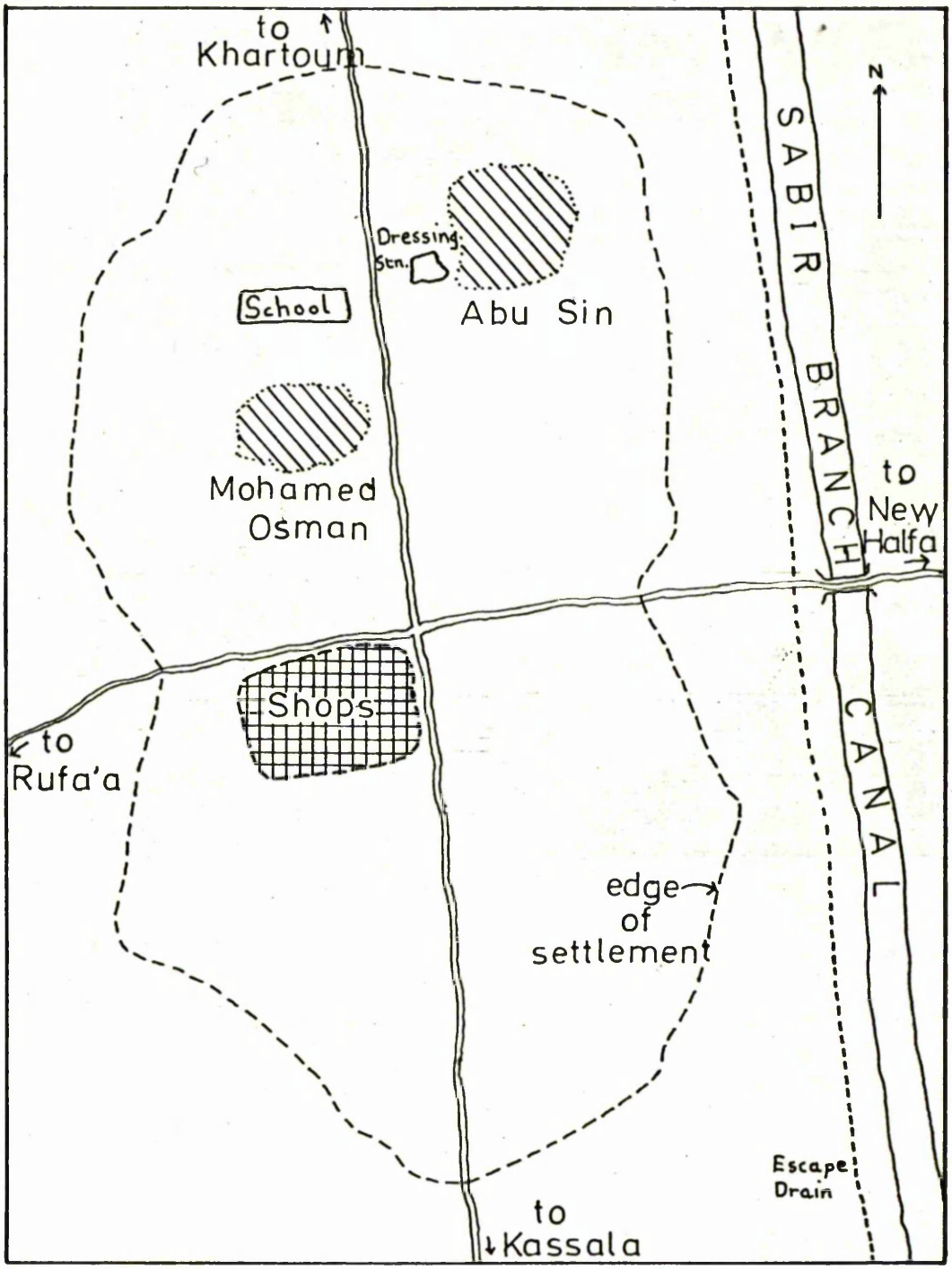
11. The costs of any empty sacks which are unused after harvesting the crop.

Appendix D: Population by village of those settlements along the River Atbara.

village	no. of families	total population
Asubri	137	501
Al Gafalla	139	524
Shelakay	187	651
Sarsareib	47	196
Kindowa	46	212
Idergawi	168	759
Gurays	44	155
Zalaq	133	561
Tara'at	65	304
Wad Nabar	260	900
Sideira	323	1570
Umrahau	342	1647
Umm Reka	147	673
Rimat Ga'ad	22	92
total	2060	8745

Source: Malaria Section, Health Department, New Halfa. Geographical Survey. Dec 1973 - Jan 1974.

Appendix E: Arrida Shukriya: an example of the spatial organisation of a village.



Scale: 1 inch represents approximately 150 yards

Appendix F: Population by village of those settlements within the scheme area.

village	no. of families	total population
No. 1.	265	1161
No. 2.(Umm Iranib)	208	881
No. 3.(Washarat)	64	298
No.44.(Shagarab)	28	108
No. 5.(New Baraysi)	214	982
No. 6.(Arrida Shukriya)	248	927
No. 7.(Al Rugda)	107	425
No. 8.(Jamaluun)	115	452
Rattagla	88	335
Rashaida	18	62
New Reira	241	889
Al Arrid	195	825
Ad Damrat	63	272
Salma Saroba	120	512
Saba'at	248	1103
New Geili	153	652
Ramsiz	96	252
Al Azaza	95	422
Abu Harira	117	537
New Sufeiya	177	537
Umm Gargur	165	684
Abu Ushar	51	216
Masak	106	505
total	3082	13037

Source: Malaria Section, Health Department, New Halfa. Geographical Survey. Dec 1973 - Jan 1974.

Appendix G: Sources of additional expenditure on the construction of the dam at Khashm el Girba

	IS
1. The diversion of the river course from the east to the west bank.	49,000
2. Lining the bed and banks of the main canal with reinforced concrete to a considerable distance at its outlet from the reservoir lake.	272,400
3. Constructional work for the turbine station at the upstream end of the Dam.	125,000
4. During the construction of the Dam, the Government decided to build a sugar factory in the Khashm el Girba area. Sugar cane, unlike other rotational crops, needs irrigation throughout the year. During the months of drought, the level of the reservoir lake was too low to feed the main canal, but there was sufficient accumulation in the deep parts of the lake, below the contour of the canal, which could not be made use of. Eventually it was decided to erect two electric relay pumps of giant bore at the Dam site to lift the amount of water required for the irrigation of the sugar plantation into the main canal during the dry season. The cost of this was:	350,000
5. Finishing touches to the Dam and other constructional works.	450,500
6. Additional machinery for the electro-mechanical works.	476,000
7. While blasting the ditch for the foundation of the Dam, Messrs. Torno unexpectedly struck a fissure in the rock sediment and had to blast deeper until they reached the bottom of the crack. This involved additional expenditure for excavating the foundation and creating a reinforced concrete lining.	91,371
8.(a). Temporary precautionary measures made at the river bed.	88,000
(b). Claim of consultant engineers for additional works.	259,534
9.(a). Claim of Messrs. Torno for accelerating the rate of building to compensate for the time lost in repairing the coffer dams and more blasting in the foundation ditch.	779,000
(b). Claim by Messrs. Torno for their works on the electro-mechanical electric work connected with the pumps.	40,000

10. Reinforcing concrete works at first prepared without reinforcement.	1,300,000
Total	4,286,803

Contract of the Ministry of Irrigation and Messrs. Torno, 24 Sept. 1966. The Council of Ministers approved this sum on 17 Oct. 1966.

Source: H.Dafalla. The Nubian Exodus. London. 1975. pp. 276-7.

Appendix H: Tables for use in the Chi-squared and Kolmogorov- Smirnov statistical tests.

Probability

df	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.03157	.03628	.00393	.0158	.0642	.148	.455	1.074	1.642	2.706	3 841	5.412	6 635	10.827
2	.0201	.0404	.103	.211	.446	.713	1 386	2.408	3 219	4.605	5.991	7.824	9.210	13.815
3	.115	185	.352	.584	1.005	1.424	2.366	3.665	4 642	6.251	7.815	9.837	11.341	16.268
4	297	.429	.711	1.064	1 649	2 195	3.357	4.878	5.989	7.779	9.488	11.668	13.277	18.465
5	.554	752	1.145	1.610	2.343	3.000	4.351	6.064	7 289	9.236	11.070	13.388	15.086	20.517
6	.872	1 134	1.635	2 204	3.070	3.828	5.348	7.231	8.558	10.645	12.592	15.033	16 812	22 457
7	1.239	1 564	2.167	2.833	3.822	4.671	6.346	8 383	9.803	12.017	14 067	16 622	18.475	24.322
8	1.646	2 032	2.733	3.490	4.594	5.527	7.344	9.524	11 030	13 362	15.507	18.168	20.090	26.125
9	2.088	2 532	3.325	4.168	5 380	6.393	8.343	10.656	12.242	14.684	16 919	19.679	21.666	27.877
10	2.558	3 059	3.940	4.865	6.179	7.267	9.342	11.781	13.442	15.987	18.307	21.161	23.209	29.588
11	3.053	3 609	4 575	5 578	6.989	8.148	10 341	12 899	14.631	17.275	19.675	22.618	24.725	31.264
12	3 571	4 178	5 226	6.304	7.807	9 034	11 340	14.011	15.812	18 549	21.026	24.054	26 217	32.909
13	4.107	4 765	5.892	7.042	8.634	9.926	12 340	15.119	16.985	19.812	22.362	25.472	27 663	34.528
14	4.660	5 368	6 571	7.790	9.467	10 821	13.339	16 222	18.151	21.064	23.685	26.873	29.141	36.123
15	5 229	5 985	7.261	8.547	10.307	11.721	14 339	17.322	19.311	22.307	24.996	28.259	30.578	37.697
16	5 812	6 614	7.962	9.312	11.152	12.624	15 338	18.418	20 465	23.542	26 296	29.633	32.000	39.252
17	6.408	7 255	8.672	10 085	12 002	13.531	16 338	19.511	21.615	24.769	27 587	30.995	33.409	40.790
18	7.015	7 906	9 390	10.865	12.857	14.440	17.338	20.601	22.760	25.989	28.869	32 346	34 805	42.312
19	7.633	8 567	10 117	11.651	13.716	15 352	18 338	21 689	23.900	27.204	30 144	33.657	36 191	43.820
20	8.260	9 237	10.851	12.443	14.578	16.265	19.337	22.775	25 038	28.412	31.410	35.020	37.566	45.315
21	8 897	9 915	11.591	13.240	15 445	17.182	20.337	23.858	26.171	29.615	32.671	36 343	38.932	46.797
22	9 542	10 600	12.338	14.041	16.314	18 101	21.337	24.939	27 301	30 813	33.924	37.659	40 289	48.268
23	10.196	11 293	13.091	14.848	17.187	19.021	22.337	26.018	28.429	32.007	35.172	38.968	41.638	49.728
24	10.856	11 992	13 848	15 659	18.062	19.943	23 337	27.096	29.553	33.196	36 415	40.270	42 980	51.179
25	11.524	12 697	14.611	16 473	18.940	20.867	24.337	28.172	30 675	34.382	37.652	41.566	44.314	52.620
26	12.198	13 409	15.370	17.292	19 820	21.792	25.336	29.246	31.795	35.563	38.885	42.856	45.642	54.052
27	12.879	14 125	16.151	18.114	20 703	22.719	26 336	30 319	32.912	36.741	40 113	44.140	46.963	55.476
28	13.565	14 847	16.928	18.939	21.588	23.647	27.336	31.391	34 027	37.916	41.337	45.419	48 278	56.893
29	14.256	15 574	17.708	19.768	22.475	24.577	28.336	32.461	35.139	39.087	42.557	46.693	49.588	58.302
30	14.953	16 306	18.493	20.599	23.364	25.508	29.336	33.530	36.250	40.256	43.773	47.962	50.892	59.703

For larger values of df, the expression $\sqrt{2\chi^2} - \sqrt{2df - 1}$ may be used as a normal deviate with unit variance, remembering that the probability for χ^2 corresponds with that of a single tail of the normal curve.

Source: Table I is reprinted from Table IV of R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research* (1948 ed.), published by Oliver & Boyd Ltd., Edinburgh and London, by permission of the authors and publishers.

Appendix I: Tables for use in the Coefficient of Correlation.

Degrees of Freedom	Significance level.						
	25%	10%	5%	2%	1%	0.2%	0.1%
1	0.9236	0.9876	0.9969	0.9995	0.9998	0.9999	0.9999
2.	0.7492	0.9000	0.9499	0.9799	0.9899	0.9980	0.9990
3	0.6340	0.8049	0.8781	0.9343	0.9587	0.9859	0.9911
4	0.5566	0.7290	0.8117	0.8823	0.9172	0.9632	0.9740
5	0.5026	0.6703	0.7544	0.8325	0.8744	0.9348	0.9508
6	0.4602	0.6208	0.7071	0.7884	0.8345	0.9049	0.9249
7	0.4271	0.5812	0.6656	0.7500	0.7977	0.8753	0.8983
8	0.4015	0.5494	0.6325	0.7158	0.7650	0.8466	0.8720
9	0.3793	0.5207	0.6017	0.6849	0.7348	0.8201	0.8471
10	0.3599	0.4967	0.5763	0.6575	0.7079	0.7946	0.8234
12	0.3297	0.4570	0.5326	0.6119	0.6605	0.7501	0.7831
15	0.2959	0.4117	0.4818	0.5573	0.6059	0.6936	0.7244
20	0.2551	0.3589	0.4183	0.4864	0.5374	0.6217	0.6524
24	0.2341	0.3295	0.3876	0.4531	0.4952	0.5760	0.6078
30	0.2088	0.2954	0.3490	0.4097	0.4486	0.5262	0.5545
40	0.1819	0.2725	0.3042	0.3573	0.4012	0.4636	0.4894
60	0.1481	0.2107	0.2500	0.2946	0.3247	0.3848	0.4078
120	0.1053	0.1498	0.1778	0.2106	0.2326	0.2771	0.2940

Appendix J: Facilities provided at the various levels of medical services centres on the scheme.

a). Medical centre.

One medical assistant, one health visitor, one laboratory assistant for malaria, one nurse, one sanitary overseer, one assistant sanitory overseer, one midwife, two malaria officers, two bilharzia officers, five sweepers and one messenger.

b). Dispensary.

One medical assistant, one nurse, one assistant sanitary overseer, two malaria officers, two bilharzia officers, one midwife, four sweepers and one messenger.

c). Dressing station.

One nurse, two malaria officers, two bilharzia officers, four sweepers, one midwife, one assistant sanitary overseer and one messenger.

Source: Personal communication. Health Department. New Halfa.

Appendix K: Example of the newsheet published by the Farmers' Union in New Halfa.

Khashm el Girba Farmers' Union
(New Halfa) Leaflet No. 8 17/11/74

Brother farmers,

Greetings,

In our previous leaflet we explained to you the rules of this project which have led to the problem of water shortage. Before cultivation began we forecast what is now happening: a shortage of water: for the causes of this still exist and no effective measures have been taken to tackle the problem, and during the last four consecutive seasons the farmer has suffered. This season the water shortage problem has begun to appear in frightening proportions. In general since the 11th November 1974 the water levels in the channels have begun to appear insufficient even for irrigating cotton and wheat, and as a result the three crops are exposed to a shortage of water besides the disease which has been affecting cotton, the disease which destroyed the crop in season 1972/73.

Brother farmers,

The preparation of the land for sowing and consequently the late start to actual sowing is something outside the farmers' control, and its responsibility lies on the shoulders of the Corporation with regard to cotton, as does the opening of the Abu XX canals with regard to all the crops. Not opening the Abu XX has led to a delay in watering even after the sowing season, and in some cases for a full month no water reaches the crops.

Brothers,

This situation has become unbearable because your efforts, the high rise in the costs of production and your source of livelihood are every season the victims of water shortage.

This Union has offered all its efforts to the local authorities to remedy the situation which you are now facing due to water shortage,

and has cabled the heads of the Ministries of Agriculture and Irrigation, but up to now no measures have been taken to remedy the situation. Therefore the Executive Committee in its 22nd meeting on 15/11/74 discussed the situation, and is convinced that the groundnut crop, as the crop first sown, is the only one expected to give a definite return, so that there is no reason to ignore it, and that for the cotton and wheat crops there is no such guaranteed return.

Therefore the Executive Committee ask the farmers not to stop irrigating the crop and to harvest the ripened crop, and to continue irrigating the crop in its maturing stage. In the event that the authorities in irrigation and agriculture insist on shutting the water off from the groundnut crop, the farmer should ignore this, and should stop irrigating the cotton crop in return for the stopping of irrigation on the groundnut and wheat crops.

Brother farmers,

There has been a succession of seasons when the problem of water shortage has received no remedy, and this situation has reached a point whereby it could escalate to a degree where either we have to take effective measures for improving the situation, or agricultural production will come to a total halt because there is no value in its continuance.

We ask the help of Allah.

Mohd. el Hassan Artiyat Allah

General Secretary on the Executive Committee.

Appendix L: The contribution of cotton to total export earnings, 1967-74.

year	percentage contribution
1967	54.8
1968	59.9
1969	60.0
1970	61.3
1971	61.1
1972	58.6
1973	55.4
1974	35.5

Source: Democratic Republic of the Sudan(b), Bank of Sudan, 15th annual report for the year ending 31st December 1974, Khartoum, 1975.